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THE

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OF THE MEDICAL SCIENCES.

JANUARY, 1908.

ORIGINAL ARTICLES.

THE DIAGNOSIS AND TREATMENT OF CARDIOVASCULAR-RENAL DISEASE.[1]

By James Tyson, M.D.,

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The meaning of the term cardiovascular-renal disease is evident. That such an association is of frequent occurrence every practitioner of experience knows. There are, however, differences in the morbid states and in the mode of invasion which influence both prognosis and treatment, and which are still imperfectly understood by many. I have for many years taken opportunity to emphasize these differences, but as I am constantly reminded in my relations with physicians that efforts in this direction have been only partially successful, I have decided to ask the indulgence of this influential body while I consider the subject somewhat further.

To begin with the simplest and best understood of the processes, it was noted almost as early as Bright recognized the varieties of morbid states associated with his name, that in a certain number of them there was hypertrophy of the heart with thickening and hardening of the arteries. Bright himself refers to both. To the arterial condition the name of arteriosclerosis was later applied and continues to be in general use. As in the further evolution of our knowledge it has been found to occur in two forms, a diffuse and a localized form, I may add that in using the term I intend the more diffuse variety, that to which von Basch has applied the name angiosclerosis, invading the vascular system as a whole and especially the smaller vessels. To the present day an explanation of this process satisfactory to all has not been vouchsafed. Bright ascribed the cardiac hypertrophy to overaction of the heart exerted in response to a direct cardiac irritant, or to overcome a resistance in the capillaries. This stimulus and resistance he ascribed to an altered quality of the blood consisting in the accumulation of toxic substances arising from defective renal excretion. Sir George Johnson elaborated the idea of a hypertrophic process in the muscular coat and transferred the irritation to the smaller arteries which further reacted upon increased effort of the heart to overcome the resistance. So far as I can learn from an examination of Bright's[2] original papers, his reference seems to be wholly to the coarser atheromatous changes which occur in the larger blood-vessels, including the aorta, and in other diseases as well—changes which are visible to the naked eye. Bright's views on the vascular changes may therefore be disregarded. In 1877 Ewald suggested an interesting modification of Johnson's theory. He also found a hypertrophy of the muscular coat of the systemic arterioles which he ascribed to increased viscosity of the blood and resulting friction in the capillaries.[3] The cardiac hypertrophy he ascribed as did Johnson to the cardiac effort to overcome the resistance in the arterioles. Though of recent authors, Johnson's pupil, Nestor Tirard, still holds to his master's view, it has been generally discarded for the more modern one, that the changes are primarily irritative, beginning at times in the media or muscular coat and extending thence to the intima and external coats, at others in the intima, always first in the arteries of small size.

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[1] Read at a meeting of the Kings County (New York) Medical Society, April 16, 1907.

One would suppose that the changes should always begin in the intima which is next the irritant blood, but that they begin also in the media is established and confirmed by recent experimental studies of R. A. Pearce and E. Mac D. Stanton[4]. It has been alleged, too, that the lesion in the media is essentially the result of injury to the elastica, the changes in the intima constituting a repair process whose object is to compensate for the weakened media and the widened lumen. It may be through the vasa vasorum that the middle coat is thus attacked by the toxic constituents of the blood. Or the thickening of the media may be the result of over pressure due to spasm excited by irritating toxins.

Confirmatory evidence of the irritant nature of the cause is found in the fact that the thickening and hardening increase with the duration of the renal disease, not always, however, in a corresponding proportion. Moreover, other conditions associated with toxic states of the blood are attended by like changes in the arteries. Such are diabetes mellitus, syphilis, alcohol, lead poisoning, the poison of gout and other products of overfeeding and overdrinking, overexertion, and especially overexertion with an excessive use of alcohol, as illustrated in workmen and drivers employed in breweries where enormous quantities of beer are drunk. To the hyperplasia succeeds in various degrees degeneration, usually fatty but sometimes calcareous, resulting in weakness of the vessel walls and occasional rupture, especially in the bloodvessels of the brain. This process extends also to the bloodvessels of the kidney in contracted kidney, but not as a rule in chronic parenchymatous nephritis.

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[2] Bright's Medical Reports, 1827, and his later paper in vol. i of Guy's Hospital Reports, 1836, Cases and Observations Illustrative of Renal Disease, etc.

[3] Virchow's Archiv, vol. lxxi.

[4] Experimental Arteriosclerosis, Transactions of the Association of American Physicians, vol. xx, 1905.

Almost invariably associated with the sclerosis of the vessels is hypertrophy of the left ventricle induced by the effort to overcome the arterial resistance and probably also as already mentioned to the direct stimulus of an irritating blood. This resistance is a complex factor, including first that of the narrowed and non-elastic vessel wall; second, the increased tension causing increased intravascular pressure and possibly also a compensatory action assumed by the heart in order to increase the secretion of urine by forcing more blood through the kidney. Nervous strain such as characterizes the strenous life of the modern business man has come to be regarded as a cause of high tension, itself a cause of sclerosis. My colleague, Dr. Alfred Stengel, who has written two or three good papers on this subject would even include neurasthenia and shock among the nervous causes operating in this way. The toxins of the acute infectious diseases may have an effect, while heredity plays an important role. In a noteworthy paper Dr. O. T. Osborne[5] suggests that certain internal secretions especially those of the thyroid gland and suprarenal capsules may be responsible for a high tension which will cause arteriosclerosis. Since the thyroid contributes a vasodilator substance and the suprarenals a vasoconstrictor stuff, an increase of tension may be caused by a diminution of thyroid secretion and an excess of suprarenal. Josué and Gouget, and after them Pearce, produced arterioscleroiss by the intravenous injection of adrenalin in rabbits. In view of the recently discovered relation of the suprarenal secretion to glycosuria we may have a further explanation of the high degree of arteriosclerosis so frequent in diabetes mellitus. The cardiac hypertrophy affects both the left and the right ventricle, but more frequently the left, as shown by the following from a recent paper by Dr. Nathaniel Bowditch Potter.[6]

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[5] The Etiology and Treatment of Arteriosclerosis, New York Med. Jour., August 20, 1904.

[6] Cardiac Hypertrophy as Observed in Chronic Nephritis, Jour. Amer. Med., Assoc., October 27, 1906, vol. xlvii.

286 *autopsies,* 151 *cases of nephritis.*

	Per cent. of hyp. of L. V.	Per cent. of hyp. of L. and R. V.	Per cent. of normal or Atro-heart.
66 chronic interstitial	30.5	11.5	58.0
22 arteriosclerotic interstitial	27.0	9.0	64.0
25 chronic parenchymatous	12.0	4.0	84.0

Recent observations go to show a larger number of cases in which all the chambers of the heart were hypertrophied.

While arterial sclerosis, recognized by a sharply accentuated aortic second sound, hypertrophy of the left ventricle with the apex displaced to the left, hard sclerosed radials, increased tension and increased blood pressure may arise quite independently of renal disease, I still hold with others that it may be also the direct result of such disease, and I may say any form of renal disease sufficiently prolonged; it is much more frequently associated with the chronically contracted kidney. Cardiac murmurs are conspicuously absent. Indeed, the presence of such murmurs removes the diagnostic value of the hypertrophy, since they point to other causes of it. On the other hand, the first sound is strong and prolonged until toward the end, when it loses its muscular character and becomes shorter and sharper. The few instances of chronic renal disease in which hypertrophy does not occur are those in which there is debility with defective nutrition, when the heart is too weak to make the extra effort required to produce hypertrophy. These cases are generally found in old persons and others whose vitality is low. Sir William Gull,[7] in a clinical lecture on Chronic Bright's Disease with Contracted Kidney, at Guy's Hospital, in 1872, referred to this form in the following language: "And here it should be observed that the kidney may undergo fibroid contraction and disorganization, and cause death by uremia, without being associated with change in the heart and arteries upon which I desire to discourse in this lecture." He continues: "In such cases the renal disease is probably due to some hereditary or congenital defect in the kidneys themselves, and is more strictly a local affection; and although the results, so far as the kidneys are concerned, may be very much like, or even apparently identical with, the more morbid conditions arising under other circumstances, what constitutional accompaniments there are, are widely different from such as occur in the disease now spoken of," referring to the condition of general arteriosclerosis (arteriocapillary fibrosis), under consideration.

Reference has been made to other causes than renal disease responsible for the arterial thickening and secondarily cardiac hypertrophy. Indeed, there are those who claim that renal disease is never the cause of arterial sclerosis, but that, on the other hand, it and especially renal contraction, with its fibroid overgrowth, is the direct result of such sclerosis of the bloodvessels of the kidney shared with the system at large, and that the cardiac hypertrophy is the result of resistance as before. To prove this was the object of the classic papers of Gull and Sutton on "Chronic Bright's Disease with Contracted Kidney (Arteriocapillary Fibrosis), published in 1872.[8] This may be the case with the arterial sclerosis and the associated renal contraction of old persons, and I repeat that I am ready to admit a primary general arteriosclerosis like that contended for by Gull and Sutton, but I still hold that many cases of arterial sclerosis are secondary to a primary renal contraction, although perhaps not so often as once supposed. The result is, however, the same, combined vascular and renal disease in which the cardiac hypertrophy is secondary to the arterial sclerosis.

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[7] British Med. Jour. December 21, 1872. See also collected writings.

If I am asked to point out clinical differences between these two varieties of sclerosis I find it difficult. Both are equally insidious, in both there is the absence of dropsy except in the very last stages of the form with primary renal sclerosis, though here it is also rare while it is wanting throughout in general arteriosclerosis. In both there is a scanty albuminuria with very few hyaline casts, but if the opportunity presents to study the urine for a time I should say the albumin and casts appear earlier in the primary renal cases. Indeed, in general arteriosclerosis there is often no albuminuria whatever, although hyaline casts are present. In general arteriosclerosis there are often brain symptoms due to anemia and imperfect circulation, namely, vertigo, tinnitus, and amaurosis. In addition to this there is often met a set of symptoms simulating those of uremia, but still not uremia. In the latter condition retinal changes occur early, but they are not those of retinitis albuminurica and hemorrhage into the retina. As pointed out by de Schweinitz there is thickening of the arteries which compress the veins where they cross them. These changes may occur early. Retinitis albuminurica, hemorrhages, and more serious derangements of vision occur only when the kidney lesion is primary. An important symptom characteristic of general arteriosclerosis is a tendency to emaciation and loss of weight, a change of color, a pallor, and loss of vigor which is characteristic. The condition of the arteries interferes with an adequate nutrition and the patient wastes as well as grows weaker and anemic. Dr. Alfred Stengel suggests that this anemia is apparent rather than real, since the blood in the vessels is simply obscured by the thickened vessel walls.

Perhaps the most characteristic difference is found in the blood pressure. In general arteriosclerosis blood pressure may be increased, but not nearly as much as in renal sclerosis when the systolic pressure is often 170 to 220 mm. as contrasted with an average normal of 145 mm.

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[8] Medico-Chirurgical Transactions, 1872, vol. iv, p. 273. Reprinted in a collection of the writings of Sir William Gull, New Sydenham Society, 1904.

An important etiologico-pathological difference is claimed by Gull and Sutton in the kidneys. According to them the destruction of renal tubules is due to the contraction of new connective tissue, the formation of which is due to the arterial changes. In primary contracted kidney the renal parenchyma dies first and is replaced by the connective tissue secondarily.

These instances illustrate two categories of associated renal and cardiovascular disease: (1) That in which the kidney disease is primary; and (2) that in which the renal condition is a part of a general arteriosclerosis. In both classes the cardiac hypertrophy is secondary.

On the other hand kidney disease may be the direct result of heart disease. This starts in and continues largely in a passive congestion caused by the backing of the venous blood into the kidney. It occurs in mitral valve disease, both stenosis and incompetency, myocarditis without valvular lesion, and sometimes also in acute dilatation. The result of the first two is the kidney of chronic passive congestion or cyanotic induration, a well recognized condition, in which there is eventually some overgrowth of interstitial connective tissue with resulting hardening; while the third, acute dilatation, causes an acute passive hyperemia of the kidney. The symptoms of passive congestion when present in mild degree are a scanty dark hued urine of high specific gravity, containing a little more than a trace of albumin, and either no casts at all or a few hyaline casts, more rarely moderately granular. In severe degrees the albumin is much increased, while the casts commonly remain the same kind though increased in number. A few red blood disks may now also be found by the microscope, but there is never enough blood to be visible to the naked eye. It is these cases which are still too frequently regarded as cases of primary kidney disease by the hasty observer, and it must be admitted that the diagnosis is not always easy, at least at the first examination. There is dropsy with albuminuria and casts, three symptoms deemed by many physicians all that is necessary to justify the diagnosis of Bright's disease. The cases which are most difficult to separate from Bright's disease are cases of myocardial disease with failing heart without signs of valvular lesion in which stasis has increased until dropsy and albuminuria have become marked. In these cases of primary heart disease arterial sclerosis is much more rare. The disease is cardio-renal in the strict sense of the term.

The forms of Bright's disease which are most frequently confused are chronic parenchymatous nephritis and such cases of chronically contracted kidney in which hypertrophy has become dilatation and the accentuation of the aortic second sound has grown feeble, while dropsy, a rare symptom in the earlier stages of contracted kidney, has supervened.

The first essential to a correct diagnosis is, therefore, a deliberate examination. The exact condition of the heart must be ascertained in each case, and if a mitral murmur is present, if the urine is scanty, of high specific gravity, even if it contain tube casts, the chances are almost all that it is a primary heart disease. If there is no murmur the difficulty is greater. But even in the absence of a murmur if the clinician will but wait a little while before making a diagnosis he will avoid error. Especially valuable in these cases is the scanty, dark colored urine of high specific gravity. Marked shortness of breath is invariable in any form of heart disease and occurs early, whereas in primary renal disease it is more frequent and occurs later. Most valuable is the information given by the heart sounds. In primary renal disease there is sharp accentuation of the aortic second sound, while in primary heart disease this is wanting, and there is accentuation of the pulmonic second sound. The bloodvessels must be carefully examined and the presence or absence of sclerosis determined, bearing in mind that this condition is much more likely to be present in primary renal disease than in primary heart disease. At the present day no examination is complete without estimating the blood pressure. In primary renal cases of either kind it is commonly high, but higher in primary renal sclerosis; in mitral valvular disease it is low, at least the disatolic pressure is low even though the systolic be high. Fortunate are we if the history of the case from an early stage is available. Too often it is wanting, especially in hospital cases.

A diagnosis is of extreme importance because prognosis is widely different and treatment by no means identical. The prognosis is much more favorable when the heart disease is primary, even when there is extreme dropsy, and I have seen patients improve incredibly even when they have been almost moribund. In the cases referred to of primary contracted kidney with hypertrophy, in which the heart muscle has given way and the hypertrophy has been replaced by dilatation, resemblance is close, but by this time the heart is very much larger than in primary heart disease, in which, too, the enlargement is also to the right, while in primary renal disease the hypertrophy is to the left only. In this condition, too, there remains almost to the very end a certain degree of accentuation of the aortic second sound and the blood pressure continues high, much higher than in mitral valve disease. We may be aided by uremic symptoms. Uremic symptoms are much rarer in the cases beginning as heart disease than in those beginning as renal disease or general arterial sclerosis, indeed very rare. Such symptoms point, therefore, to the latter condition. But I often find that the practitioner interprets as uremic, symptoms otherwise explainable, and sometimes it is not easy to say whether they are uremic or not.

Now as to treatment. To begin with the cases which may be classified as more easy of diagnosis, in which there are signs of chronic interstitial nephritis, commonly polyuria, small albuminuria, no dropsy, hyaline and pale granular casts not very numerous, hypertrophy of the left ventricle, sclerosed arteries, and high blood pressure, 160 or more mm. of mercury. Are there curative measures? I fear not curative in the strict sense of the term but certainly helpful. Whether the process has started in the bloodvessels as a whole or began in an interstitial inflammation of the kidney, toxic substances have been at work irritating the renal tubules and the intima of the arterioles, impairing the integrity of both. Such substances have arisen from over consumption of any kind of food, but especially proteid foods and alcoholic drinks, perhaps also tea and coffee. These, therefore, must be cut out of the dietary and substituted by milk and cereals and vegetables. If there be constitutional syphilis, it must be treated; if diabetes, the sugar removed from the blood; if gout, the uric acid and purin bodies eliminated. The last is accomplished by excluding proteid substances, including especially glandular organs such as sweetbread, liver, and kidney, which are especially rich in purin bodies. If the patient is overworked mentally or physically he must rest.

Can we remove the sclerosed vessels, overgrown connective tissue in the kidney, and the hypertrophied heart by drugs? I fear not. But we may counteract their effect and perhaps retard their increase. The iodides not only have the tendency to remove overgrown connective tissue but also to act as permanent vasodilators. Vasodilatation is especially desirable. How far it is possible I do not know; indeed, it has lately been denied, but I am in the habit of using the iodides with seemingly good effect. They may act, too, as is claimed by some by diminishing the viscosity of the blood, which may be one of the causes of cardiac hypertrophy. I prefer the iodide of sodium given in doses rarely large but commonly as large as can be borne without disadvantage. My doses never exceed 10 grains three times a day. More frequently they are less, but they must be kept up continuously. When there are retinal symptoms (retinitis albuminurica) I substitute the biniodide of mercury in $\frac{1}{48}$ to $\frac{1}{24}$ grain doses. In spite of this the conditions slowly grow worse, although I think they may be retarded.

As to other treatment, it must consist mainly in combating symptoms. Digitalis is not, as a rule, indicated; indeed it may be harmful. Should the cardiac action become too powerful tincture of aconite in three to five drop doses, three times a day or oftener, will calm the unruly organ, especially if associated with rest and a reduced amount of food. Nitroglycerin, reputed a prompt vasodilator, may be used under the same circumstances in doses of $\frac{1}{100}$ to $\frac{1}{50}$ grain at short intervals, as often as once in two hours, and is sometimes advantageously kept up for a long time at longer intervals. Nitrite of sodium may be given in 3 to 5 grain doses as often. I do not think the nitrites are as satisfactory as aconite when there is powerful cardiac action. On the other hand, they sometimes produce an aggravation of the symptoms, producing an unpleasant fulness in the head, to which however, the patient soon becomes accustomed.

General massage is a means of treatment which is often beneficial, helping the circulation and easing the work of the heart.

However unsatisfactory the treatment for this class of cases may be, it can be for the most part intelligently directed because the diagnosis, as a rule, has been correctly made. It is not so with the other divisions, namely, those associated with dropsy and large albuminuria and casts, which may be due to valvular disease or myocardial disease, to parenchymatous nephritis or the last stages of chronically contracted kidney. Fortunately the treatment is not widely different; indeed, up to a certain point it is identical. Thus, whichever of the conditions named is present, the patient must be put at rest in bed. This is sometimes difficult to carry out. He has perhaps been sitting up night and day, and imagines he will suffocate if he goes to bed. The bed should, however, be insisted upon, and in twenty-four or forty-eight hours he will be convinced by the results. He should also be put on a milk diet. Here, however, the treatment of the two classes of cases begins to diverge. If the case is one of primary heart disease, liquids should be restricted, although they may still be the best form of food. The patient's tissues are water logged, and we want to reduce the water rather than add to it. Yet I have seen such patients deluged with liquids, because, in the opinion of the physician, it was necessary to pass water through the patient to wash him out and thus diminish the danger of uremia. But this particular patient is not in danger of uremia, and to sluice him with water tends to aggravate a symptom we seek to abate. The liquid ingesta must be cut down. Nay, more liquids must be removed from him. He must be purged with hydragogue cathartics, the best way to get fluid from him. He must be sweated by hot-air or vapor baths or by hot packs, and the secretion of urine stimulated by diuretics if possible.

Here, too, we may expect diuretics of a class to act which in advanced renal disease are useless, viz., diuretics of the theobromin class which act directly on the renal epithelium and require therefore a certain integrity of this tissue for the best results. Of these, besides theobromin and caffein, there are three—diuretin, theocin, and agurin. Theobromin is a drug difficult to dissolve, but, nevertheless, I have seen it produce free diuresis in cardiac cases—given in simple admixture with water in doses of 45 grains in twenty-four hours. Pharmaceutical chemists have therefore sought to produce soluble compounds of this substance. Such are diuretin, agurin, and theocin. Caffein is a good representative of this class and has the advantage of being a cardiac and cerebral stimulant also. It is a soluble derivative of the xanthin bodies, a trimethylxanthin, while theobromin is a dimethylxanthin and is insoluble. I have used caffein with great advantage in conjunction with digitalis and its congeners which act by increasing blood pressure and which are suitable for both renal and cardiac disease. A favorite treatment with me in such cases is to alternate digitalis and caffein, especially caffein sodio-benzoate, giving each every four hours, alternately, suiting the dose of each to the case; say of tincture of digitalis 5 to 10 minims, and of caffein citrate 3 to 5 grains. The citrate of caffein must be given in larger doses than caffein, one-third larger. Caffein sodio-benzoate is suited for hypodermic use. Of late I have been substituting the fluid extract of digitalis for the tincture.

Theobromin has the advantage of being more prolonged in its action than caffein, but it is not so well borne by the stomach. The same is true of diuretin, a soluble combination of theobromin (50 per cent.) with salicylate of sodium. Diuretin is also an uncertain drug. Two or three years ago I received from a medical friend in Boston a useful hint on the use of diuretin. He informed me that as found in the shops it is often inefficient because spoiled, in which event it makes a turbid solution. The drug should therefore be thus tried, and if it does not dissolve in clear solution it should be discarded. On the whole I have been rather disappointed in diuretin, whose effect is moreover temporary and in my experience taxes the stomach severely. It is given in doses of 5 to 15 grains three to four times daily.

A far better derivative of theobromin is theocin or theophyllin or dimethylxanthin sodium. Theocin is an alkaloid which exists in small amount in tea leaves, discovered by Kossel in 1888. The quantity is, however, so small as to be unavailable. It has therefore been produced synthetically by Bayer, who also makes a soluble double salt of acetate of sodium and dimethylxanthin, acet-theocin sodium or soluble theocin, a preparation more efficient and less irritating to the stomach. It is given in doses of 4 to 8 grains three times daily for an adult, in solution or tablet form, or half as much twice as often. When successful prompt diuresis results, the urine increasing to 70, 80, 100, or more ounces daily. As compared with theobromin again its effect is less persistent, and with caffein it lacks the effect of cardiac stimulation. Another preparation which seems to differ only in the quantity of dimethylxanthin is agurin, with which I have as yet had no experience although it is an older remedy than theocin. All these remedies require a certain degree of integrity of the kidney and are therefore much more efficient in primary heart disease than in primary kidney disease; in fact, they are of little or no use in advanced renal disease, whence their inertness has some diagnostic value.

As to the withdrawal of liquids you may ask, How is this accomplished by a milk diet? I answer, by restriction of the amount ingested; easier done with milk than any other shape of food, while it is moreover in an easily assimilable shape. We may begin with

2 ounces every two hours, which will make but 24 ounces in the twenty-four. Such a patient is not hungry and will not cry for more. Nor is he in danger of starvation. He will feed on his serous effusion and in a few days he will begin to be hungry. I have frequently noted the beginning of happy results when the patient begins to be hungry. The serous effusion will start to disappear. Before this, however, the tension should have been removed by purgatives and sweats and the secretion of urine in increased quantity have set in. Even in cases of pure renal origin I think the matter of fluid ingestion is sometimes overdone, and I have had to insist on the restriction of liquid in these cases in order to remove dropsies and effusions.

It may be necessary even to add to these measures incision of the legs or the use of Southey's tubes in order to facilitate the extraction of liquid from the tissues. I prefer the former. The better method is to make a single incision an inch long behind each ankle rather than to make more numerous and smaller incisions throughout the leg. Enormous outflow of fluid is often thus secured, while the relief to tension favors the action of the diuretics.

Supposing the renal changes to be primary in these water-logged cases, the form producing these symptoms is most frequently chronic parenchymatous nephritis. The difference is greater in prognosis than in treatment, the former being much more grave. The success in the treatment of the variety just described depends almost entirely on the degree of integrity of the kidney which remains. The rest and diet are the same. The measures to relieve tension and remove the anasarca are the same as to purgatives and sudorifics, but the class of remedies so useful in producing diuresis and in stimulating renal action is comparatively useless, and the drugs which increase cardiac contraction and favor osmosis are most useful, that is as representing the former, digitalis and strophanthus, given in full doses and the same doses for each, 10 to 15 minims. It should be remembered that the infusion of digitalis is often in these cases more efficient than the tincture. Broom is another diuretic which sometimes acts very well. In times past broom tea was found efficient, but fell into disuse because of its bulkiness and disagreeable taste. It has been replaced by its active principle, spartein, in the shape of the sulphate. Many years ago I began to use spartein in the dropsy of Bright's disease and thought I was giving quite large doses when prescribing $\frac{1}{4}$ grain with such frequency as to secure two grains in the twenty-four hours. They were certainly much larger doses than heretofore griven. Now I advise it in even larger doses, $\frac{3}{4}$ grain every three hours. I have never known any harmful result and it is well borne by the stomach.

As representing the salines or osmosis promoters, the citrates, tartrates, and acetates are indicated and may sometimes be advantageously combined with cardiac stimulants in the same prescription. Purgatives and sweats are also necessary in these cases. Purgatives are especially useful also from the standpoint of eliminators of toxic solids, which the kidneys are helpless to remove, as well as water, von Noorden's experiments having shown that urinary toxins are very much more freely removed by the bowel than by the skin, and thus uremia is averted. Of aperients, every one knows that the hydragogues are indicated, including especially salines, compound jalap powder, and elaterium.

In this connection I will allude to a drug which I think merits more frequent trial, a purgative and diuretic so striking in its effect at times as to have received the name of internal trocar, and that is, apocynum cannabinum, the root of the Canadian hemp. Only recently a friend informed me that in a given case he found it so active as to cause the patient to pass a bucketful of urine in a given night. Unfortunately it is sometimes so irritating as to produce vomiting as well diuresis and purging. An active principle known as "apocynin" is less irritating. It is put up in $\frac{1}{6}$ grain granules, of which 3 are given every two hours until the effect is secured.

We must not forget an old but still excellent diuretic and eliminator sometimes producing magical effects, namely, the pill of calomel, squills, and digitalis, in doses of calomel, $\frac{1}{2}$ grain; of squills, 1 grain; and of digitalis, 1 grain, three or four times a day. I have known a dropsy which has resisted other measures to disappear with rapidity. The purgative and diuretic effect are commonly both secured. Here again it is in the anasarca of primary cardiac cases that we have the best results, although they are sometimes obtained in renal cases also.

These measures will cure a number of milder cases and once in a great many times the severer will yield. When this is the case there must be a considerable remnant of the kidney intact or nearly so. It used to be said that if we can keep our patient alive until the stage of contraction is reached his chances of prolonged life are improved, but I have of late years doubted whether this is true. In the contracted stage there is less secreting structure than in the parenchymatous stage. In this variety the danger of uremia is greater, but not nearly so likely to present itself as in contracted kidney.

Most important to remember is the fact that a diuretic which answers in one case often fails in another, and it is therefore necessary to have a full quiver of remedies to be drawn upon judiciously as needed.

It may be expected of me to say something of the influence of chloride retention upon œdema and albuminuria. Strauss in Germany and Widal and Javal in France, in 1902 and 1903, called attention to the fact that there is an abnormal quantity of sodium chlorid in the tissues of persons affected with dropsy, reporting cases in which it was possible to cause œdema to appear and disappear almost at will by varying the amount of chloride in the diet. The rationale of these events is supposed to be as follows: In nephritis the ability of the kidney to excrete chlorides is decreased, whence their accumulation in the tissues and the consequent accumulation of water in the same tissues in order to keep the chloride in solution. Although there appear to be exceptions and the parallelism is not always demonstrable, the truth in general of the statement seems to be admitted. An opposite theory, that the primary trouble in nephritic œdema is the retention of water to which the retention of salt is secondary, is not sustained by the weight of evidence, which goes to show that the chloride retention is primary and the water retention secondary. Chloride retention has been observed in some cases of cardiac dropsy and in some cases of œdema occurring in patients with inflammatory disorders, but there is no evidence to show that there is any causal relation between the two conditions or that the chloride retention is more than can be explained by the retention of fluid in the œdematous parts.

As to the treatment of renal dropsy growing out of these facts, it would naturally consist in the elimination from the diet of food rich in chlorides, which enables the kidney to remove with ease the remnant remaining in the tissues. It is advised to reduce the chlorides ingested to 2 or 3 grams daily. This is accomplished by a diet including eggs, unseasoned meat, unsalted butter and milk, bread without salt, fresh-water fish, potatoes, rice, fresh vegetables, fruits, and chocolate.

THE TREATMENT OF PNEUMONIA, ESPECIALLY BY OUTDOOR AIR.

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In 1906 there were treated in the Presbyterian Hospital in New York 128 cases of acute lobar pneumonia. The patients were of every age and the cases were of every sort, many of them alcoholic, and many constituting the terminal factor in chronic diseases of necessarily fatal type. An interesting fact is that among the recoveries were 47 patients (or 36.7 per cent. of all the cases) who received absolutely no medicinal treatment whatever, except the occasional laxative which any bedridden febrile patient may require. No cardiac stimulants were given, no hypnotics, no vaso-dilators, no inhalations, no empirical remedies. These patients were for the most part treated with good fresh outdoor air throughout their entire illness. They were placed either upon a roof or in small rooms where the artificial ventilators were sealed up and the heads of their beds set at the windows, kept wide open day and night, often with the thermometer below 35 or 40° F. I commend such facts to those who are addicted to writing articles for medical journals entitled "Ten cases of lobar pneumonia with nine recoveries, all treated by large doses of quinine," or nitroglycerin, or digitalis, or cold compresses, or guaiacol carbonate inhalations, or what not. I, too, have faithfully tried all these and many other "systems" of treatment in this disease, year by year, with the growing conviction that the only rational treatment of lobar pneumonia is the symptomatic one. Not all patients need digitalis, because not all have weak hearts; not all need aconite or nitroglycerin, because not all have initial high tension and full arteries; not all need poultices or ice-bags, or cold compresses, because not all have local pain. It is well enough and time enough to employ such remedies in any special case when the need arises, but never with the idea that the natural progress of the disease can be uniformly modified, much less aborted by them. But what every pneumonia patient does require is a plentiful supply of flowing fresh outdoor air which has never been in the lungs of anyone else, as ward air and room air always has been, and which has not been heated or *roasted* until it has lost all power of invigoration. In order to deliver furnace heat in a room, or air hot enough to warm a large ward, such air must previously have been cooked over hot pipes or steam coils, often to a temperature of 300° or 400° F., so rapidly does it lose temperature in its conduction through long ducts and by mixing with the air of the room. In the Presbyterian Hospital, for example, I found that all the ward air in winter supplied by the "closed ventilation" system was previously roasted in the basement to 400° F. One would not feed a patient with scurvy upon sterilized milk, nor a patient with anemia upon canned vegetables, and why feed a patient with the extreme air-hunger of pneumonia upon baked air?

Moreover, it was found by analyses made for me by C. G. L. Wolf that in those same wards after twenty visitors had been admitted for an hour with four nurses and two doctors, the carbonic acid content rose to 5.13 parts per 10,000 as compared with the normal 4.06 parts in the fresh air outside, an increase of 20 per cent. In any private room in winter with a very ill pneumonia patient there are also usually two nurses, one or more of the family, and the physician, all of whom by frequent visits share in breathing the air which has been already superheated. One finds such rooms in which, with windows tight shut, canned oxygen is being constantly liberated, after it has been superheated and confined for some time in a metal receptacle and finally blown through stale water and an unpleasant rubber tube. I formerly advocated its employment myself, but it is so much cheaper, simpler, and better to open the window. In round figures the normal atmospheric air contains 20 per cent. of oxygen, of which only 5 per cent is removed by the red blood cells in respiration, which are practically saturated with oxygen under normal conditions of atmospheric pressure. The remaining 15 per cent., of atmospheric oxygen is returned *unused* in the exhaled air. Canned oxygen differs from air in that the 80 per cent. of nitrogen of the air has been replaced by oxygen. But if there is already a margin of 15 per cent. of oxygen in fresh air, or three times the actual need of the organism, what is the object of adding more? The normal saturation of the red blood corpuscles prevents their carrying any more oxygen, nor can the plasma absorb it under conditions of normal atmospheric pressure. What canned oxygen may do is to replace some of the vitiated air that over-zealous friends or nurses pollute about the patient's bed. Hence it may be worth five dollars a can when they cannot be kept at a distance and will not allow the window to be opened for fear of a "draught." But the patient's chances of life are all on the side of fresh air. If he be entirely outdoors, on a balcony or roof, there is no "draught." If he be at an open window there is less danger of a draught the wider it be open, that is, of a chilling current of rapidly moving air. If he be wrapped up, as he should be in cold weather, precisely like a tuberculous patient, with extra blankets, a hot water bottle to the feet, and a woollen hood closely enveloping his head, no draught will ever harm him.

In such treatment of pneumonia I have learned to discard the "draught" as a bogie born of prejudice and inexperience. When the bowels are to move or when hyperpyrexia requires a cold pack, which latter seldom occurs with patients treated outdoors, they are temporarily moved into the ward.

In the wards of Bellevue Hospital is found what is probably the largest alcoholic pneumonia service in the country, because the service is given over to the sick poor, not a few of them being the lowest type of diseased, underfed, and more or less chronically drunken emigrants. The buildings are ninety years old (although new ones with verandas opening off every ward are in process of construction). The main buildings are faced with balconies intended originally for fire escapes, but large enough to accommodate a number of ward beds. For the past few seasons it has been my constant practice to treat all pneumonia patients as far as practicable by moving their beds out on to the balconies through the ward windows, which are cut down to the floor. The results have been most gratifying. It is the universal testimony of the nurses that they have much less "nursing" to do, the patients are so much quieter, less actively delirious, or less complaining, and they sleep so much better. It is the universal testimony of the patients themselves as their mental state improves, that they feel better outdoors. When they are necessarily returned to the ward for special reasons, or because the service is so overcrowded that they must give place to the more seriosuly ill, they often beg to be returned to the outdoor air. When we cannot place them on the balconies we place the beds by open windows and keep off the ward air, as far as possible, with screens. The balcony floors are of wooden slats, and sometimes, last winter, we had to place rubber sheets over the beds to protect them from the drip of melting snow above. Sometimes it was so cold that the sputum froze in the cups.

In not a single instance, in either of the hospitals to which I have referred, have I had cause to regret the open air treatment, or known any difficulty to arise from it. At Bellevue Hospital I hesitated at first for fear some delirious patient might leap off the fire escape, as they often attempt to leave their beds in the wards, and there is an insufficient number of nurses to watch them at every moment. I therefore had protective wire nettings put up (heavy tennis netting). The nurses and house staff soon learned, however, that the patients who were actively delirious in the wards, become so much quieter after a short interval in the open air, without hypnotics, that we now seldom hesitate to leave them temporarily by themselves. They are also less restless, less cyanosed, and sleep much better.

It is not claimed that the open-air treatment of pneumonia is always curative by any means, but it often is, and the advantages above enumerated are not only very great, but are uniformily obtainable. In alcoholic subjects especially it is found that much less stimulation is required, and it is often possible to do without it altogether. Formerly I gave large quantities of alcohol in cases of pneumonia in alcoholic subjects, anticipating delirium tremens, but now I rarely find it necessary to employ it at all. Neither is it claimed that *every* patient having pneumonia should be placed at once in the open air, no matter what the weather may be. As in every other form of treatment there are cases in which routine is undesirable, such as may arise among the very aged or very feeble marasmic infants, or patients having serious cardiac disease; in other words, asthenic cases with low temperature reactions. But even among this type benefit is often obtained, and the principle is the same, although modifications as to air temperature or other precautions may be desirable. It is not necessary that the air temperature should be cold, but fresh, that is, *uncooked* it should be always. Moreover, the natural changes in air temperature and moisture, as between night and day atmosphere, possess undoubted physiological value for those in health, which is missed in a monotonous climate. How much more are they missed by the cyanosed, dyspnœic patient compelled to breathe cooked air at the same temperature day and night. Many a chapter upon the hygiene of the sick-room begins with the fallacious postulate, "The air of the room should be kept uniform at 68° or 70° F.;" that is, the air may be ever so "stuffy," the nurse may have breathed it before the patient, it may have no vitality whatever, but if the thermometer declares it to be of the correct temperature, it goes! How much more reliable a guide is the educated and appreciative nose than the thermometer!

It is no new principle which is enunciated herein. From time to time for many years the open-air treatment has been advocated for pneumonia as well as for many other diseases, but it becomes desirable at times to restate old principles in the light of new experiences, and I submit that the physician, not the architect, is the proper person to treat pneumonia. The architect arranges elaborate "closed ventilation" artificial systems, automatic thermostats, and all manner of appliances and structural devices in hospitals and houses for the maintanence of uniform temperature. The physician disregards routine, opens the windows, vivifies the air, permits the patient to have the same advantages of natural air changes when he is ill that he may have when he is up and about, and even rescues him from the architect altogether by placing him sometimes outside the house. As Walter B. James has said, in writing of this subject, "The time is soon coming when the hospital roof will be defined simply as 'the floor of the top story.' "

In order not to be misinterpreted as an advocate of a "fresh-air crusade" I would add that when patients with pneumonia have very weak hearts they should have digitalis, irrespective of theoretical considerations as to intrapulmonary blood pressure; when harassed by cough they should have codeine (heroin being too depressing); when distressed by pleuritic pain they should have codeine and a poultice too, if they wish it, or an ice-bag if that gives more relief, for neither makes the slightest modification in the natural progress of the disease, because neither heat nor cold superficially applied reaches the deep-seated area of inflammation.[1] When the patients have insomnia they should have trional, as being a non-depressant hypnotic. If they have alcoholic delirium, they are best controlled by paraldehyde, or, in grave emergency, hyoscine, but morphine is to be avoided if possible, as small doses occasionally produce overwhelming results in pneumonia. For hyperpyrexia (104.5° + F.) they should be given cold sponge baths, and for sustained very high temperature, cold packs. For pulmonary œdema they should be cupped and given atropine hypodermically. Tympanites should be avoided as a very menacing symptom, because not only is the natural freedom of the diaphragm restricted and breathing seriously interfered with, but intestinal autointoxication is added to the pneumonic toxemia. Hence the desirability of' using purgatives, enemas, intestinal antifermentatives such as salol, and turpentine stupes, whenever this most serious complication threatens. It is well also temporarily to remove milk from the dietary, as in typhoid fever with tympanites. Abundant water should be drunk to promote elimination, and the ordinary diet should consist of soups, broths beef juice, eggs, farinaceous gruels, and milk. Oranges and weak coffee may be taken.

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[1] See the writer on "Local Thermotherapy," New York Medical Record, April 13, 1907.

With this simple but effective armamentarium one may deal satisfactorily with the greater number of the more serious cases of pneumonia, but it will be found that much of it, simple as it is, may be unnecessary if the patient has continuous access to fresh free flowing air.

THE LENHARTZ TREATMENT OF GASTRIC ULCER.

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Although Lenhartz, in January, 1904, published his results of treating gastric ulcers by feeding without a preliminary period of starvation, this method has not appealed to the profession generally. The older plan of combining starvation and gastric rest with rectal feeding, as a prerequisite to a course of graduated milk diet, has held its time-honored preëminence.

This accepted method of treatment could almost be called classic, for it received its first impulse from Cruveilhier at the time of the modern awakening of medicine, and its development has been associated with the names of such masters as Ziemssen and Leube. This older method still retains its hold on the practitioner both because it fulfils the seemingly rational indications to give an open wound rest and to substitute an efficient means of nourishing the patient while the normal food supplies are contra-indicated, but also because it cures if efficiently carried out a very large majority of the patients even if their symptoms are severe and accompanied by profuse hemorrhage and its resulting anemia.

The cases which form the basis of this study are few in number, but so striking in results, that a judgment on the Lenhartz treatment seems justified. They include 5 cases of ulcer of the stomach and 3 cases of hyperchlorhydria, probably unassociated with ulcer. They are from the records of the New York Hospital.

The routine treatment of gastric ulcer at the New York Hospital has been, for many years, to carry out the old systematic cure of Ziemssen and Leube. The results have been good, but the occurrence of the 2 following cases led to a trial of the Lenhartz treatment, with the results which are given here. The first of these cases to present an unusual complication is, in brief, as follows:

The patient was a well-developed man, a carpenter, and came under treatment December 27, 1905. He was prostrated by heat six months previously (July 18), and ever since had suffered from attacks of vomiting with intense pain in the stomach. Attacks follow the taking of solid food. Patient has been on a diet of raw eggs, stale bread, and milk almost continuously for four months. Weighs 157 pounds, a loss of 13 pounds from top weight. He is constipated and has never vomited blood or seen tarry stools. Physical examination showed normal heart and lungs, a palpable spleen, and a stomach splash to navel; there was no pain or tenderness, but the right abdominal rectus was distinctly resistant. Blood and urine examinations were normal, the stools showed "occult" blood, and an Ewald test meal showed a free HCl of 30, a total acidity of 50, and there were no evidences of gastric stasis.

The patient was put on a routine ulcer cure and fed by nutrient enemas of peptonized milk and eggs. This was continued, with gastric starvation, except for water, for thirteen days. Gastric feeding, with peptonized milk, was begun, and by the twentieth day of treatment the patient was taking eight ounces of milk every four hours. On this day he developed a purpuric rash on both legs, with pains and with spongy, bleeding gums. The ulcer cure had developed a typical attack of scurvy. Under proper and rapidly increasing diet the patient made a good recovery and remained well and cured of all symptoms two months later.

The second patient presented the complication of continuous small hemorrhages in spite of the starvation and the gastric rest of the classical cure. The history of this patient during the first two weeks of her stay in the hospital is as follows:

Mary K., single, aged thirty-two years, domestic, was admitted June 28, 1906. After seven days of rectal feeding and gastric starvation, and a subsequent seven-day period of very moderate gastric feeding with fully peptonized milk, she continued to have occult blood in the stools, had a hemoglobin percentage of 39, and presented the therapeutic problem whether to continue medical treatment or to resort to surgery, with the idea of doing a gastro-enterostomy. Before resorting to surgical interference, it was decided to try a Lenhartz course, which resulted in a cure, as shown in the detailed history of Case I below.

The Lenhartz treatment is based upon the principles, first, to furnish nourishment and improve the patient's general condition, and thus favor the better healing of the ulcer; second, to prevent distention of the stomach both by careful limitation of size of each food portion and of the fluids taken, and by the use of ice applications externally; and third, to prevent the action of the excessive HCl content on the ulcer surface by combining it with food albumin and by the use of bismuth subnitrate internally.

These indications of the Lenhartz treatment are accomplished by fulfilling the following conditions: First, to continue to nourish the patient by feeding by the stomach; second, to use concentrated foods, rich in albumin, for this purpose, in order that the acid of the gastric juice will be rapidly combined with the food proteid; third, the exhibition of the food in small amounts at short intervals of one hour; fourth, the insisting on slow mastication and slow eating, which is best accomplished by feeding the patient by teaspoonful amounts to each mouthful, and by never allowing him to feed himself during the whole two weeks' period; fifth, to insist on a three to four weeks' rest cure in bed; and, sixth, of course other medicinal procedures are allowed if indicated, for example: an icebag to the epigastrium and bismuth subnitrate internally for hemorrhage, enteroclysis for the effects of hemorrhage, and iron and arsenic for the anemia. The routine course of treatment covers two weeks' time, and includes the following articles of diet, which are prepared as here detailed: Fresh milk, iced; raw eggs, the whole egg is beaten up and iced; both the milk and the egg are prepared in a covered glass tumbler, surrounded with cracked ice, and kept at the bedside. The feeding spoon is also kept iced in the same manner. The only change in the early routine consisted, if the patient preferred, in mixing the eggs and milk and feeding the mixture, instead of the hourly alternation as prescribed by Lenhartz. Granulated sugar is added to the eggs after the third day. The raw scraped beef, boiled rice, and zwiebach are prepared in the usual manner. Cooked chopped chicken was substituted in these cases for the raw ham of the original Lenhartz dietary, to conform to the taste of the patients treated; and, finally, butter is a prominent article of diet.

The following changes were also permitted from the strict rules of Lenhartz, and after the tenth day broiled chop, beefsteak, or chicken was substituted for the raw beef, and ice-cream was added during the last four days in several cases The zwiebach was changed to toasted bread, and other cereals took the place of rice during the same period.

Up to the tenth day a strict adherence to the routine was insisted upon, both in regard to the amounts of each article of diet and to the feeding intervals, and also to the totals of each article for each daily ration. The food was given in hourly intervals during ten days from 7 A.M. to 9 P.M., and a complete rest was allowed during the night for ten hours. The iced foods were prepared in small quantities as needed. The daily schedule, with amounts of each article of diet, is as follows:

Day.	*Eggs.*	*Milk.*	*Sugar.*	*Scraped Beef.*
I.	2 drams each dose; total, 2 eggs.	4 drams each dose; total, 6 ounces.		
II.	3 drams per dose; total, 3 eggs.	6 drams per dose; total, 10 ounces.		
III.	Half ounce per dose; total, 4 eggs.	1 ounce per dose; total, 13 ounces.	20 grams added to eggs.	
IV.	5 drams per dose; total, 5 eggs.	1½ ounces per dose; total, 1 pint.	"	
V.	6 drams per dose; total, 6 eggs.	14 drams per dose; total, 19 ounces.	30 grams.	
VI.	7 drams per dose; total, 7 eggs.	2 ounces per dose; total, 22 ounces.	40 grams.	36 grams in 3 doses.
VII.	4 drams per dose; total, 4 eggs. Also, 1 soft-boiled egg every four hours; total, 4 eggs.	2 ounces per dose; total, 25 ounces.	40 grams.	70 grams with boiled rice, 100 grams in 3 doses.
VIII.	"	2½ ounces per dose; total, 28 ounces.	"	"
IX.	"	3 ounces per dose; total, 1 quart.		Beef same. Rice 200 grams, Zwiebach 40 grams in two portions.
X.	"	Add cooked chopped chicken 50 grams, also butter 20 grams.	"	"

XI–XIV. Interval of feeding made two hours, milk given in 6-ounce doses with ½ ounce of raw egg. Butter increased to 40 grams and various additions made, as detailed above.

The 5 cases of gastric ulcer which were treated by the Lenhartz method presented positive evidence of hemorrhage at the time of beginning treatment, and should be classified as belonging to the severe type of the disease. Four of the patients presented a marked anemia from loss of blood, and the hemorrhage continued for eight, twelve, thirteen, and twenty-one days after beginning treatment. In spite of this the routine was persisted in because of the success in the first case tried. Each case presents some point of special interest.

In Case I the limit had been reached of a course of medical treatment of fourteen days, organized on the old plan. The patient's condition would not permit of a renewal of the starvation period nor would the bowel tolerate a return to a strenuous course of colonic feeding. It was a serious question if surgical interference did not offer the only relief possible. The improvement under the Lenhartz cure was more rapid and more satisfactory than a mere study of the written record with its positive blood reaction in the stools for twelve days and its slight rise of only 4 points in hemoglobin for the same period would lead one to infer. The patient lost her anxiety and became calm and contented. The very evident daily increase in her diet had a most soothing effect on her mental condition. She felt and knew she was getting well. She has remained well and has had no stomach symptoms.

Case II presented a second attack of hematemesis; the first attack had been treated surgically by the excision of a part of the stomach wall, which was about two inches square and contained five or six bleeding points. No gastro-enterostomy had been done at that time. The Lenhartz cure was complicated by a personal distaste on the part of the patient for the milk and raw-egg diet even to the point of nausea and vomiting, which was controlled by magnesia internally, an ice-bag to the epigastrium, and by one period of twenty-four-hour cessation of the cure. Except for this the recovery was steady, and the patient left the hospital on the thirty-fifth day, free from gastric symptoms. She has remained well and has been at work continuously ever since.

Case III presented on admission a marked anemia, large tarry stools, a febrile action ranging from 100° to 104° for seven days, a distinctly evident irritation of the peritoneum and an inflammatory blood. The white cells counted 16,200 to 22,800 and the polymorphonuclear percentage ranged from 83 per cent. on admission to 75 per cent. on the eighth day of observation. The question of perforation of an ulcer with the necessity of a surgical emergency operation was present throughout the whole first week of treatment. The Lenhartz treatment was begun at once, and, combined with the needed stimulation, brought the patient back to a less critical state at the end of a week. The stimulation consisted of strychnine and digitalone hypodermically, notwithstanding the existing hemorrhage. This patient was kept in bed four weeks, and was discharged from the service on the forty-first day after admission. At present the patient is well, has gained weight, and has no stomach symptoms.

Case IV might be characterized as a routine case of the severer type. The hemorrhages did not cease until the thirteenth day, and the hemoglobin fell to 19 per cent. In spite of these evidences of a lowered vitality, the patient felt well and took his routine food with appetite. This patient reached a point quite below that usually set as a safe one for the performance of abdominal surgery and yet he made a good recovery. Now he is in good health, but eats irregularly, often hurriedly, and suffers occasionally from a burning pain in the epigastrium.

Case V presented a condition similar to that of Case IV. She was admitted suffering from a severe gastric hemorrhage, with low hemoglobin (20 per cent.), tarry stools, and temperature of 102°. The patient made an excellent recovery and was practically well on the twenty-second day of treatment, when she began to show an increasing febrile action. She developed typhoid fever which ran a typical course with relapse. It must be considered a very favorable fact for the Lenhartz treatment that no gastric complications arose in this attack. The patient was finally discharged after sixty days of hospital care, cured of both the gastric ulcer and the typhoid fever. She has worked continuously from the day of discharge from the hospital, has gained over ten pounds in weight, has no stomach symptoms, and feels better than at any time in her life.

The course of the progress in these 5 cases may be seen in the following table, which shows the time of the disappearance of blood from the stools, the gain of weight, and the gain in hemoglobin content of the blood:

Case.	Stools first free from blood by chemical test.	Weight first out of bed.	Weight on discharge.	Hemoglobin percentages.			
				On entrance.	Lowest observation.	At end of routine cure; 14 days.	On discharge
I	12th day	95	109	38	36	44	66
II	Never found . . .	125	126	85	83	83	90
III	21st day (very faint after 16th)	101	108	46	34	40	75
IV	13th day	123	129	29	19	33	58
V	8th day	no observations	no observations	20	20	34	54

The Lenhartz routine was applied in the treatment of three other patients who suffered from an hyperacid secretion, but who probably did not have a peptic ulcer.

The first of these, Case VI, was an uncomplicated case, with pain and vomiting. He was discharged on the seventeenth day of treatment, just three days after the end of his Lenhartz cure. The diagnosis of ulcer in such a case might seem justified by the facts, but the rapid cure and absence of symptoms during treatment would rather tend to a diagnosis of simple hyperchlorhydria, in spite of the blood found in the test meals. Lenhartz has suggested that such cases of possible ulcer without hemorrhage be given a shorter course of treatment, and that the dietary regimen be begun on the fourth to sixth days of the regular cure. This patient six months later was perfectly well and had no trouble with his stomach

The 2 remaining cases present serious complications of stenosis of the pylorus, one a mechanical benign stenosis and the other a functional stenosis. Both gave the symptom complex known as gastrosuccorrhea.

Case VII presented a dilated stomach and hyperacidity, but with no retention of food after the period of night fasting. The analysis of the fluid taken from the fasting stomach showed a free HCl of 24, a total acidity of 50. She was very neurasthenic and difficult to manage, and up to the time of beginning this treatment lost both weight and strength. Under the Lenhartz routine, which was brought to a successful end, and after ten days of after-treatment, the patient gained thirteen pounds in weight and eleven points in hemoglobin. The only symptom remaining at the time of discharge was a slight morning nausea. After four weeks the patient left the hospital, but returned two months later with a lesser attack of the old symptoms. The vomiting was the prominent feature of her relapse, and has persisted to some extent ever since.

Case VIII gives all the classical symptoms of a benign stenosis of the pylorus due to adhesions. The patient had been in the surgical service at intervals during the previous five years. He was first operated on for chronic appendicitis and a catarrhal appendix was removed. He gave at that time symptoms of gastric stasis of two and one-half years' duration. Three months later he was re-admitted for dilated stomach, due to pyloric stenosis and tuberculous peritonitis. A posterior gastro-enterostomy was done. Fourteen months later he returned to the hospital with the same symptoms, and an anterior gastro-enterostomy was done. One year later he was operated on again, and many peritoneal adhesions were broken up. On admission to the medical service his free HCl was 56, total acid 72, and he had been vomiting continuously for three weeks. The Lenhartz treatment was complicated by vomiting attacks, but he was discharged on the twenty-seventh day after beginning the cure. A test meal at the end of the treatment resulted in a free HCl of 22 and a total acidity of 56. After leaving the hospital he was comfortable at first on a diet of meat, eggs, and bread, taken in frequent small meals. But two months later his symptoms had returned and he was re-admitted to the hospital. A gastric examination showed stasis, a gastrosuccorrhea, and a hyperacidity. The fluid from the fasting stomach had a free HCl of 33, a total acidity of 52, and an Ewald test breakfast had a free HCl of 47 and a total acidity of 66. A second Lenhartz cure was given and he was discharged after twenty days' treatment. When seen six months later he weighed 135 pounds (a gain of 37 pounds in all). He had been working steadily for three months; he is on small frequent meals of a selected food and wears an abdominal belt.

This group of cases includes only 8, but they are all of the severer type. They all were benefited by the treatment, and, except the cases with stenosis, they all were cured. One patient was cured after a distinct failure of the older treatment. One patient recovered from very threatening symptoms of an impending rupture of the ulcer. The fact that no failures are recorded in this short series, and that at least 2 patients were kept free of surgical interference, do not warrant the conclusion, however, that the Lenhartz cure is infallible. It is far from being a miraculous cure, and it will never entirely eliminate surgery from the treatment of gastric ulcer. Lenhartz would limit surgical treatment of gastric ulcer to cases with stagnation of food and to those with perforation, peritonitis, or subphrenic abscess. But further experience will undoubtedly find some failures, and surgery will still find its application in a broader field in this disease than would be given to it by Lenhartz. This cure would seem to have a special use in cases with low hemoglobin, which are bad subjects for surgery, even if operative interference is needed later for continuing hemorrhages, for relapses of ulceration, or for the single indication of Lenhartz (motor insufficiency).

This series does warrant the conclusion that the original claims of Lenhartz are correct: First, that the cure is at least equally as efficient as the older method, and that it does not deplete the patient; second, that the cure is more rapid as well as more certain; third, that the vomiting and bleeding stop more quickly and relapse less frequently than in the Leube cure; fourth, that the pain ceases promptly and that morphine is never needed; fifth, that the food supply is sufficient throughout; sixth, that it is possible to treat the anemia earlier with iron and arsenic than in the Leube cure; and seventh, that it is possible to return to a full diet and to the patient's usual occupation earlier than in the older cure.

THE DIAGNOSIS AND TREATMENT OF THE GASTRIC NEUROSES.[1]

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Nothing is more common among our patients than a complaint of "stomach trouble." Again and again this is the answer given when they are asked what brings them for advice. The frequency of this complaint has impressed itself upon me throughout a number of years in both private and dispensary practice. To determine more accurately the proportion of cases in which it is the chief item in the history, I have recently reviewed the records of all the cases seen in the Medical Clinic of Cooper Medical College from January 1, 1900, to January 1, 1906. During this time there came under observation 4232 cases; and of this number I find that 574 have given "stomach trouble" as the complaint that led them to seek advice. Of course it is well understood that the patient's complaint does not always indicate the site of disease; and yet it is interesting to note that a large proportion of patients are thus shown to have trouble with their digestion.

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[1] Read at a meeting of the Nevada State Medical Society, at Reno, Nevada, October 8, 1907.

In the sifting of these 574 cases of self-labeled "stomach trouble" we have been able to distinguish four groups: (1) Cases in which the symptoms were really due to disease of other than the digestive organs; (2) cases in which the symptoms were due to disease of the digestive organs, but to organs other than the stomach; (3) cases in which the symptoms were actually due to organic disease of the stomach; and (4) cases that could only be classified as gastric neuroses.

Group I. In this group we found the stomach symptoms distinctly attributable to heart lesions in 10 cases, to chronic nephritis in 8, to pulmonary tuberculosis in 8, to chlorosis in 5, to arteriosclerosis in 3, to diabetes in 1, to pregnancy in 1, to secondary anemia in 1, to angina pectoris in 1, and to malaria in 1. In this group, therefore, in which the symptoms of stomach trouble were really due to disease entirely outside the digestive tract, there were found altogether 39 cases.

Group II. Cases in which the symptoms of dyspepsia are produced reflexly, by disease of digestive organs other than the stomach, are even more frequent than those in Group I. We found a large number of cases in which the symptoms could be best explained by the chronic constipation that accompanied them and best removed by correcting that disorder. Of such cases, in which the bowels would not move for several days in succession, and in which the chief complaint, nevertheless, was of the stomach, we found 43. In 8 other cases the stomach symptoms were distinctly due to cirrhosis of the liver; in 2 to cholelithiasis, in 1 to enteroptosis, in 1 to appendicitis, and in 1 to pancreatic cyst (diagnosis confirmed by operation). Thus, there were in this group 56 cases altogether. The most significant fact of all, which seems worthy of special emphasis, is the frequency with which complaint of "stomach trouble" has been found on examination to be associated with no discoverable change in the stomach, but disappears entirely with the relief of chronic constipation.

Group III. It is a matter of surprise to find that a comparatively small number of the patients whose chief complaint is of the stomach really give evidence of organic disease of the stomach when careful examination of the organ is made. We have been able, however, to make the following diagnoses with certainty: chronic gastritis 55 times, cancer 37, ulcer 10, dilated stomach 2, in all 104 cases of organic disease. In this number the diagnosis was positive; but it must be remembered that there were probably others, here classified in the fourth group as gastric neuroses, which might have proved to be organic disease of one form or other if we could have had them long enough under observation and had been able to follow their course.

Group IV. There still remain 375 cases, not belonging to any of the 3 [preceding groups, that have been diagnosticated as gastric neuroses; and it is to this very large group, constituting the great majority of patients whose complaint is of stomach trouble, that I wish to call attention at this time.

MEANING. By the gastric neuroses are meant the cases of purely functional disorder of the stomach, without discoverable organic change. The neurosis may be secondary to organic disease elsewhere in the body, but in this review such secondary neuroses have been consigned to another group. Among the 375 cases of primary gastric neurosis here collected no organic disease could be found, either in the stomach or in any other organ. Popularly these cases are known as "nervous dyspepsia," and this designation will here be considered as synonymous with gastric neurosis. Theoretically they vary in name according to the particular function of the stomach that is found to be most disturbed, whether this be secretion, motility, or sensation. But, practically, disturbances of all the functions are found so variously combined that it is frequently difficult to decide which predominates in any given case; and from my experience with the material here reviewed, my own conviction is that too great refinement in diagnosis among these gastric neuroses is not profitable, even if it be desirable.

As regards secretion we have learned repeatedly, in dealing with these cases, that very great and persistent complaint of distress during digestion may be associated with a secretion practically normal after a test meal; while at another time, with no complaint at all of digestive disturbance, analysis may show a secretion abnormally high or low in acidity. The character of the secretion, therefore, cannot be the only factor concerned in producing symptoms.

As regards motility, there seems good reason to believe that impairment of the stomach's power to mix its contents thoroughly and to expel them promptly into the bowel may play a very important part in the production of distress during stomach digestion. But, after all, we have no reliable method of proving impaired motility, except the discovery of abnormal food particles in the test meal removed, indicating retention; and this, in my experience, if repeatedly found means almost invariably organic disease—either the changes in the stomach walls that come from chronic gastritis or cancer, or the obstruction at the pylorus that follows as a sequence of ulcer, pyloric cancer, or perigastric adhesions. For the existence of minor grades of impaired motility, such as might come from faulty innervation, we have no absolutely certain test; nor have we any way of proving, on the other hand, that moderate disturbances of motility invariably produce symptoms.

Disturbances of sensation, especially hyperesthesia, seems after all to be the most certain factor in the production of dyspeptic symptoms; for by this patients become to a greater or less degree conscious of the digestive process and restless and uneasy and distressed so long as it goes on. In no other way does it seem possible to explain many cases of gastric neurosis that persist after secretory and motor abnormalities have been excluded so far as our methods of examination permit, and even after the diet has been carefully directed so as to prevent undue irritation. Such exaltations in the sensitiveness of the gastric mucous membrane have seemed to me to be the predominating factor in the production of symptoms in a great majority of the gastric neuroses, no matter whether the secretion was found normal, decreased, or increased, or whether the motor power seemed deficient or excessive.

To sum up the matter: By the gastric neuroses, or nervous dyspepsia, we mean those cases of stomach trouble in which there is constant complaint of varying kinds of discomfort during the digestive process, but in which careful examination shows no evidence of organic disease in the stomach itself. Probably no one function of the stomach is ever exclusively at fault, but the one most concerned in producing symptoms seems to be that of sensation.

Etiology. With this understanding as to the nature of the trouble, we are now in position to ask about the factors that produce it. In most cases neurasthenia underlies the gastric neurosis, and the causes of the former thus become the causes of the latter. But not all neurasthenics have stomach trouble; very frequently it is the heart, the genital organs, the eye, or some other organ that furnishes the major complaint. There must be some special influences that determine the stomach neurosis in preference to another, but the explana- of these influences is not altogether clear. However, the following factors have seemed especially to affect the incidence of nervous dyspepsia in the patients with whom we have had to deal: (1) Age, (2) sex, (3) nationality, (4) character of the food, and (5) conditions under which food is taken.

1. *Age.* Our patients have ranged as follows: Under twenty years, 14; between twenty and thirty, 86; between thirty and forty, 146; between forty and fifty, 64; between fifty and sixty, 46; between sixty and seventy, 19. Thus, while these figures show that the gastric neuroses occur at all times of life, they also show that the most frequent occurrence is in the decade between thirty and forty, and that a much larger number are found before than after forty—246 on one side as compared with 126 on the other side of this line. The gastric neuroses are certainly more frequent in early life, when ambitions are more eager, appetites more keen, emotions less under control, and excesses of all kinds more likely to occur.

2. *Sex.* Among the 375 cases 235 were males and 140 females, which makes it appear that nervous dyspepsia is more common among men. It must be remembered, however, that in any public clinic more men than women attend, which undoubtedly has some influence upon the preponderance of males among these cases. Nevertheless the fact here shown by figures corresponds with my own experience in private as well as in dispensary practice—that

gastric neuroses are more common among men, while other forms of neuroses—particularly cardiac and genital—are more common among women.

3. *Nationality.* I have had occasion previously to call attention to the cosmopolitan character of the population of San Francisco, as shown by the different countries represented in our clinic. Naturally the United States furnished the largest delegation to our aggregation of nervous dyspeptics, with 112 representatives; Italy came next with 76, Ireland third with 43, Germany fourth with 30, and Sweden fifth with 14; while Russia and England each supplied 11 cases. Besides these larger groups we had smaller ones from each of the following countries: Switzerland, Finland, Denmark, Norway, Portugal, Canada, Poland, Austria, France, Mexico, Central America, China, Japan, Scotland, Spain, Dalmatia, Wales, Belgium, Syria, New Zealand, Shetland Islands, and Azore Islands. There are two significant facts brought out by this examination of the nationality of our cases: first, that no race of people is exempt from stomach trouble; second, that among the foreign born the excitable Italians furnished so large a proportion of our material.

4. *Character of the Food.* Much has been learned in the last few years about the influence different foods exert upon the stomach's functions; and from the facts thus ascertained we are able to see more clearly how the character of the food may influence the development of the gastric neuroses. The first information of value upon this subject was furnished by Pawlow in his book, *The Work of the Digestive Glands;* and more recently the similar work of Bickel has still further opened our eyes. In questioning our patients about their habits regarding food, the following points have seemed to have an especial bearing upon the causation of their stomach trouble:

(*a*) *The Quality of the Food.* It has been shown by Pawlow in dogs and by Bickel in human beings that certain kinds of food-stuffs call forth more gastric juice than others. Bickel states very definitely, for instance, from actual observation, that the following substances elicit an abundant secretion: among drinks, all alcoholic and carbonated fluids, animal broths, and meat extracts in solution; all the spices, including mustard, pepper, salt, cloves, etc.; among solid foods, red meats when cooked rare, bread and all foods resembling bread in composition, that is, in a combination of albumin and starch. On the other hand, a slight secretion only is elicited by fats and cream; by well-done meats and coarse vegetable foods like boiled potatoes, cabbage, spinach, turnips, and carrots; and by sugars and sweets. Assuming now an underlying neurasthenia, it is easy to see that prolonged indulgence in the first group of food-stuffs may gradually induce an habitual hypersecretion during digestion, with all the subjective symptoms of hyperchlorhydria; or that a similar persistent use of the kind of foods described in the second group may lead to an habitual deficiency of secretion, with the symptoms of subacidity.

(*b*) *The Preparation of the Food.* It has also been shown by the work of Pawlow and of Bickel that well-cooked food, presented in an appetizing way, has much to do with exciting the secretion of gastric juice; and that the looks of the food and its odor start the secretion of the gastric glands at once, even before the food enters the mouth, provided the looks are attractive and the odor is the agreeable one brought out by proper cooking; while, on the other hand, no such secretion occurs in advance unless the appetite is so aroused. Again, it is easy to see that the food of the poor man's table, selected for cheapness, poorly cooked, served with no thought of its appearance, may lead the stomach into the bad habit of inadequate secretion and the patient ultimately into a clinic for stomach trouble.

(*c*) *The Mastication of the Food.* By Pawlow's experiments also it was shown that by the act of mastication the gastric glands were reflexly stimulated to secretion, and that if chewing was sufficiently prolonged the food mass when finally swallowed found an adequate amount of gastric juice waiting to receive it; but that if chewing was hasty and food was swallowed rapidly a much smaller amount of secretion was in readiness when the mass reached the stomach. Furthermore, if the food is not finely divided by the teeth, it must be more vigorously triturated by the stomach walls in order to convert it into a soft, pultaceous mass; this throws extra work upon the stomach, which may result in faulty motility in an individual whose supply of energy is in every way deficient, as it is in neurasthenia. Thus in two different ways hasty eating and improper mastication may impair the stomach's function and ultimately bring about a gastric neurosis; and hasty eating is one of the commonest vices of the day.

5. *Conditions Under which Food is Taken.* The fact has long been recognized from experience that the circumstances surrounding the taking of food have much to do with its digestibility; and that emotional disturbance during a meal, such as vexation or anger, may make the best food disagree. Recently this fact has received a scientific explanation, through one of the experiments of Bickel. He found that if a dog, just before its feeding, was angered by a cat, the stomach secreted only about 9 c.c. of gastric juice, whereas ordinarily it secreted about 67 c.c. Furthermore, if the cat was brought into the room at a time when gastric secretion was at its height, the latter suddenly stopped, dropping from a rate of 28 c.c. every five minutes to 8 c.c. in the same length of time. This explains the common observation that food taken under disagreeable conditions so frequently gives rise to distress. No doubt many times the gastric neuroses owe their origin to such a cause. Meals eaten habitually in the midst of wrangling and dispute, or while the mind is occupied

with recalling disagreeable incidents of the day's work, or under the influence of worry about the cares of the household or the family, can scarcely fail to derange the stomach's functions and thus bring about a chronic state of nervous dyspepsia.

Clinical History. The symptoms of nervous dyspepsia are manifold and include every complaint about digestion that has ever entered into the mind of man. The story most often heard has been one of distress after food, described as a discomfort, a burning, a sense of weight, a load, a heaviness; this distress varying in severity in different cases until it becomes in some actual pain, as unbearable as that produced by true organic disease. Next in frequency comes the cry about "gas" on the stomach, flatulence, belching, a sense of distention, rumblings, and internal explosions. Third in order of frequency comes a sense of nausea while digestion is in progress, frequently persisting until the stomach is emptied by vomiting, which terminates the discomfort until food is taken again. All sorts of variations of these cardinal symptoms have been met with in the cases reviewed. No two patients tell their story just alike, and the most diverse combinations of minor and major items occur. There is, therefore, no characteristic clinical history that makes us certain we are dealing with a gastric neurosis. Every history of "stomach trouble" may mean serious organic disease, and no diagnosis ought ever to be made on subjective evidence alone. Two points in the story, however, always make us suspicious that gastric neurosis is the real condition present: (1) The long duration of dyspepsia, in many of our cases amounting to months or even years; and (2) in spite of this long duration, no particular disturbance of nutrition or of strength. As regards the various forms of gastric neurosis, only one, hyperchlorhydria, seems to have a fairly constant history. Here the patient's story is of a burning pain, with belchings and sour eructations, coming on two or three hours after food is taken, persisting until the next meal, which relieves the discomfort entirely, or until vomiting occurs at the height of the distress, emptying the stomach of its very acrid, irritating contents. These cases can usually be recognized by the account the patient gives of them, but not always; and a diagnosis should never be made of the form of neurosis, any more than of a neurosis itself, on subjective evidence alone. Except for hyperchlorhydria, there is no other neurosis that gives a history even fairly constant.

Stomach Analysis. From what has already been said, it will be understood that the conception of a primary gastric neurosis excludes all organic disease; and that physical examination of other parts of the body shows no lesion to account for the gastric symptoms. There still remains, however, the investigation of the stomach's functions, and this we accomplish by the analysis of a test meal. In our series of cases the meal employed has been the Ewald test breakfast of toast and water, removed after one hour. We have taken phenolphthalein as the indicator and titrated with the decinormal sodium hydrate solution to determine the total acidity; and, following the lead of most authorities, have accepted 40 and 60 as the lower and upper limits of a normal total acidity. Out of the 375 cases diagnosticated as gastric neuroses, 284 had such analyses made, in the great majority a number of different times. Of these cases 136 showed a subacidity, 133 a hyperacidity, while in 15 the degree of acidity fell within normal limits, even though there was constant complaint of "stomach trouble."

There remain 91 cases in which no stomach analysis was made, but in which the history of long-continued dyspepsia, the absence of any evidence of organic disease, and the well-preserved nutrition made the diagnosis of gastric neurosis the only one possible. These cases in which no analysis was made divide themselves into three groups: (1) The patients who positively refused to take a test meal, a rather large group among the ignorant class with whom we have to deal in a dispensary clinic; (2) those who took the test meal and were willing to have it removed, but in whom we found it impossible to pass the tube because of the struggle that the attempt caused; and (3) those who took the test meal and had the tube passed at the end of one hour, but without our obtaining any stomach contents—cases described as hypertonia, a neurosis of motility, by which the stomach is emptied prematurely.

Diagnosis. Before making a diagnosis of gastric neurosis in any patient complaining of stomach trouble, a great many precautions must be taken. Subjective symptoms alone mean nothing. A thorough physical examination of the heart, lungs, blood, and urine comes first, to eliminate what has been classified as Group I among the cases of dyspepsia. Then the history and physical examination must be directed to the liver and gall-bladder, the intestines, and rectum, before we can exclude these and decide that disorder of the stomach itself is really the cause of the so-called "stomach trouble." Finally, we must determine whether organic disease of this organ is present or whether the symptoms are due solely to functional derangement; and this is the hardest task of all.

Of course, if the symptoms have lasted for months or for years with variable intensity; if the patient is still well-nourished and strong in spite of persistent dyspepsia; if besides the stomach symptoms there are other evidences of a neurasthenic condition but no evidence of the presence of a tumor in the stomach, or of dilatation or bleeding, it then becomes easy to conclude that the case is one of gastric neurosis, even without the aid of stomach analysis after a test meal. But if, on the other hand, there has been loss of weight and strength coincident with the "stomach trouble;" or if the symptoms have persisted in spite of intelligent treatment directed to a supposed gastric neurosis; if still there is no tumor demonstrable, no hemorrhage, either outspoken or occult, and no evidence of food retention;

then, in spite of every effort, we are often left in doubt as to whether or not organic disease exists, even though repeated stomach analyses have been made. What we most desire is an early recognition of organic disease, before it has advanced to the stage of gross changes, such as a palpable tumor or an open vessel with free discharge of blood. In this early stage there is a chance for cure, but there is also a chance for serious error, because we cannot attain certainty in diagnosis and must be satisfied largely with probability, even after every ordinary method of investigation has been employed. Not a few of the cases that seem to be simply gastric neurosis when first observed gradually prove themselves something more serious as the months go by; and in the group here recorded as gastric neuroses I have no doubt there were some incipient cases of ulcer and of cancer that might have been ultimately recognized if we had had our cases long enough under observation. My conclusion about the gastric neuroses, therefore, is that they constitute, undoubtedly, the largest group of stomach disorders with which we have to deal; but that this diagnosis, no matter how honestly made, often masks a primary organic disease of whose existence time will gradually unfold the conclusive proof.

It seems to me very important, therefore, to emphasize the necessity for constant vigilance, repeated investigation of all kinds, and close attention to the results of therapy in these cases of gastric neurosis; with a keen realization that the diagnosis first made may later have to be revised; that the case of persistent hyperacidity ought to be given routine medical treatment for gastric ulcer long before hematemesis and attacks of gastralgia make the diagnosis certain; and that the case of persistent subacidity, with or without the evidence of chronic gastritis, ought to be submitted to the surgeon for diagnostic incision without waiting too long for a palpable tumor or for coffee-ground vomitus to convince us that cancer is the real disease present.

Prognosis. Gastric neuroses do not kill, but they render life exceedingly unpleasant—for the physician oftentimes as well as for the patient. It is best not to be too positive about promising rapid cure just because we do not find organic disease. My own experience is that these cases are usually protracted and obstinate, yielding for a time to treatment, only to recur; though it is possible to cure them entirely with persistent repetition of our instructions and with intelligent coöperation on the patient's part in carrying them out. Two points are especially to be borne in mind when giving an opinion as to outcome: (1) The possibility, just mentioned under diagnosis, that what seems clearly at first to be a gastric neurosis may prove later to be ulcer or malignant disease; and (2) that in order to effect a cure we must depend more than anything else upon a change in the patient's habits of living and upon his compliance with restrictions that are not always acceptable. For these reasons the prognosis should always be guarded, so that physician and patient may equally avoid disappointment if progress is slow.

Treatment. Nervous dyspepsia constitutes the paradise of the fakir and the patent medicine man. It is the great frequency of "stomach trouble" that calls forth the immense crop of digestive tablets and elixirs, advertised to the public in street-cars, on billboards, in the newspapers, and on trees, cliffs, and hillsides. As a matter of fact, however, these much-vaunted remedies do no more than relieve symptoms temporarily, and do not always do that; for the cure lies not so much in drugs as in reformation of the habits of life. The rational treatment of the gastric neuroses looks less to the outward manifestations than to the conditions and surroundings that have called them forth, and the details that must receive consideration are the following:

1. *The Underlying Neurasthenia.* This in general calls for a return to "the simple life," with less stress and strain. Excesses of all kinds must be sought out and stopped, of whatever nature they may be—in study, in business, in society, in household duties, or in sexual affairs. Without such investigation and correction of our patient's occupations and surroundings, habits, and ambitions, we cannot hope to accomplish much; for people with stomach trouble need intelligent directions as to rational living far more than they need prescriptions. No doubt the systematic rest cure in a sanitarium, or travel, with the diversion and change of scene it gives, are valuable adjuncts to treatment; but for the majority they are simply out of the question because of limited means. On the other hand, it is always possible to insist upon regular hours for meals; regular hours for sleep; a daily bath; systematic outdoor exercise, even if it be no more than a walk to and from work or business; and the avoidance of introspection, self-examination, and self-pity. Such advice, however, is only too often utterly rejected by the ignorant, who have no use for any remedy that does not come out of a pill-box or a bottle.

2. *The Way Food is Taken.* It has previously been shown how much this has to do with the production of dyspepsia. People must be taught that food eaten rapidly always digests slowly and often with distress; and inadequate chewing of food is one of the most common causes of stomach trouble. Again, rest for a short time after meals, before mental or bodily activity is resumed, is often all that is needed to make digestion go on unawares. Excitement, worry, and annoyance while at table are a common source of trouble, and often their elimination suffices to overcome the long-standing digestive distress. All of these matters must be carefully explained to the patient, no matter how trivial they may seem; for upon such apparent trivialities success in treatment often hinges.

3. *Quality and Quantity of the Food.* Habitual overeating is a frequent source of dyspepsia, for continued overwork induces exhaus-

tion in the stomach as in the brain or any other organ. Hence, reduction in the amount of food taken is in some cases the most valuable therapeutic resource. Consciousness of this fact has recently led to the adoption of certain popular fads for the cure of dyspepsia, such as the "no breakfast" cure or the "no lunch" cure. They are not altogether fads, though the mistake made is in adopting them promiscuously without previous investigation of the true nature of the "stomach trouble."

Habitual overindulgence in certain kinds of food is also a matter for investigation and correction. Any of the food-stuffs may thus cause offence if repeatedly taken to excess. It may be the starches, the sugars, the fats, or the proteids; it may be coffee, tea, or alcohol; it may be acids or condiments. The particular kind of food that is being taken too freely can best be found by questioning the patient regarding his habits and his preferences; and such questioning should form a part of our routine examination as a preliminary to advice.

But our best guide as to the quantity and quality of the diet to be prescribed is furnished by the analysis of the test meal; for this tells us what particular function is at fault and how it is deranged. If the condition proves to be one of hyperacidity, the essential feature of which "consists in an abnormal irritability of the secretory apparatus of the stomach during its time of labor," then food should not be given too often and not of such kinds as especially stimulate secretion. Three meals a day are usually enough and a mixed diet has proved most useful. Fats, cream, and butter; well-done meats of all kinds; milk and cocoa; vegetables like boiled potatoes, cabbage, spinach, turnips, and carrots; sugars and sweets—these are the foods especially indicated; while spiced, salty, and sour articles of diet, coffee and alcoholic and carbonated drinks, ordinary bread-stuffs, and rare meats must be excluded.

If the condition is found to be one of subacidity, exactly the opposite course is indicated. The food should be taken in small quantities at short intervals, for there is no stimulation to secretion equal to the act of eating. Meats cooked rare; bread-stuffs, crackers, zwieback, and toast; condiments, spices, salt foods; alcohol in moderation and carbonated waters; animal broths and meat extracts—these are the foods that should be given; while fats, sweets, and coarse vegetables are contra-indicated and should be omitted. In subacidity especially the value of attractive preparation of food and of thorough mastication as stimulants to secretion must be impressed upon the patient.

If there is faulty motility, as found by food retention and delay in emptying the stomach, then the quantity at each meal must be small, especially the fluids. The food must be finely divided—meat in a minced or scraped condition, vegetables in the form of purees, and cereals in gruels. Crackers, crisp bread, zwieback, and toast must be thoroughly ground by the teeth, and all coarse foods with much bulky residue—as beans, corn, spinach, etc.—must be avoided.

4. *Drugs.* The use of these is constantly necessary to combat disagreeable symptoms, but it must be understood that they are only adjuncts and not the main resource in the treatment of the gastric neuroses. The useful ones can best be considered under the head of each important type of neurosis:

Hyperacidity. In hyperacidity drugs help us (*a*) by checking gastric secretion and (*b*) by neutralizing excessive secretion. To check secretion our best drug is belladonna, given in doses of $\frac{1}{4}$ grain of the extract a half-hour before each meal, the efficacy of which has been proved both experimentally and clinically. To neutralize excessive acidity, bicarbonate of sodum is the popular remedy, and a useful one; but a formula learned originally from Stockton has been used in our clinic for a number of years past, with most satisfactory results; it consists of cerium oxalate, 2 drams; bismuth subnitrate, 4 drams; and the light carbonate of magnesium, 1 ounce; of which powder 1 teaspoonful is given one or two hours after meals, when the symptoms of excessive acidity appear.

Subacidity. In subacidity drugs come to our aid (*a*) by stimulating secretion and (*b*) by supplementing deficient secretion. To stimulate secretion the bitter tonics have proved most satisfactory; and of these we have employed with greatest frequency the tincture of nux vomica, in doses of 10 to 30 drops before each meal. To supplement deficient secretion we employ dilute hydrochloric acid in doses of 10 to 30 drops, well diluted, after each meal.

Faulty Motility. For this neurosis, strychnine has been found our most reliable drug, given before or after meals, in doses of $\frac{1}{40}$ to $\frac{1}{20}$ grain. As disturbances of motility are usually found combined with secretory disturbances, the state of the secretion must also be carefully considered before drugs are prescribed.

Hyperesthesia. In cases in which symptoms of dyspepsia persist in spite of normal analyses and negative findings as regards disturbed motility, we have had excellent results in our clinic from sodium bromide and valerian, given in the following formula: Sodium bromide, 20 to 30 grains; elixir of the valerianate of ammonium, 1 dram—such dose given in water after each meal, continued for several weeks or a month.

5. *Physical Treatment.* The various physical methods suggested for influencing secretion, such as intragastric galvanization or faradization, intragastric douches and sprays with various medicated solutions, or abdominal packs and hydrotherapeutic applications, have never seemed to me to yield satisfactory results. Even the value of gastric lavage is probably overestimated and, in my opinion, it should not be employed as a routine measure day after day. It has its value in the relief of symptoms, to remove hyperacid gastric

contents to stop distress, or to remove retained or fermenting material when motility is deficient; but it is doubtful whether it can influence the secretion of the stomach in any way. All of these measures do harm by keeping the patient's attention directed to the stomach and reminding him of its delinquencies; and in the neuroses this is a distinct hindrance to recovery.

THE DIAGNOSIS AND TREATMENT OF INFECTIONS OF THE BILIARY PASSAGES, WITH SPECIAL REFERENCE TO CHOLELITHIASIS AND CHOLECYSTITIS.

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The work of such men as Kehr and Riedel in Germany, Mayo, Robson and Moynihan in England, and Richardson, Mayo, and others in America, has of late years placed the surgery of the biliary passages, and especially of cholelithiasis, upon a firm footing. The actual work at the operating table has been the prime factor in elucidating the very obscure facts in connection with the etiology, pathology, and diagnosis of these conditions, assisted though it has been by many brilliant researches and careful postmortem pathology. As in appendicitis, so in gall-bladder disease, it remained for the surgeon to show how different is the process in life from the end result as shown at the necropsy.

I shall report herewith the results of my own work in a series of 217 cases of gall-bladder surgery, more especially in reference to cholelithiasis and cholecystitis. This includes 182 cases of calculous cholecystitis, and 35 of non-calculous cholecystitis.[1]

There is no doubt that cholelithiasis, cholecystitis, and all their results, near and remote, should be really classed as consequences of infection. The infection may not always be demonstrable in its results, the causative factor not always to be found when the damage has been done, yet in my opinion the inflammatory factor is the important one in all but the malignant diseases of the biliary tract.

While there is still some divergence of opinion concerning the exact method of the formation of gallstones, all authorities seem agreed that a bacterial invasion of the gall-bladder is a necessary factor. The effects of stasis of bile, peculiar chemical composition of the bile, and of the condition of the gall-bladder mucosa are not so well understood.

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[1] These comprise the cases operated upon between January 1, 1903, and April, 1907.

Concerning the mode of infection there is much doubt, yet in most cases it is apparently by means of the portal circulation. The character of the infection varies. Much stress has of late been laid upon the importance of enteric fever as a causative factor in cholelithiasis, and this has been fully borne out by my experience. Of 182 patients with calculous cholecystitis, that is, cholelithiasis, 51 (28.0 per cent.) had at some time or other had enteric fever. The interval between the occurrence of the enteric fever and the appearance of symptoms of cholelithiasis varied from a few weeks to many years. In several cases in which there had been enteric fever previously we have been able to recover Bacillus typhosus from the gall-bladder or ducts at the time of operation; in one case as long as forty-one years after the occurrence of the acute infection. Yet more interesting is the fact that Bacillus typhosus was recovered from the gall-bladder in 4 cases in which absolutely no history could be elicited of any acute invasion of the intestinal tract resembling enteric fever.[2] Why the biliary tract should be the seat of choice, and why the bacteria should be able to remain there and continually pass down through the intestines without causing further trouble I shall not attempt to explain. Numerous other bacteria have been found by us. As would be expected, Bacillus coli predominates. Thus, in the 182 cases of cholelithiasis, cultures were made in 94,[3] of which there were: Sterile 46; Bacillus coli in 25; Bacillus typhosus in 13; Staphylococcus pyogenes in 5; unidentified 3; Bacillus coli and staphylococcus in 2. Bacillus subtilis was found within calculi in 1 other case.

In practically half of these cases the cultures were sterile. This is not so remarkable when we consider the fact, already mentioned, that the condition most favorable to the formation of gallstones is one of mild infection by an attenuated culture of an organism whose virulence has been decreased to a minimum. Thus it is easy for the gallstones to be formed and for the bacteria to die gradually and be absent at the time of operation.

In the 35 cases of non-calculous cholecystitis, acute and chronic, cultures were made in 18; 6 (33.3 per cent.) showed Bacillus coli communis; 12 were sterile.

The nature or degree of severity of the infection cannot furnish us with any indication of the organism present, at least so far as I have been able to judge. The various bacteria have been found to give rise to practically the same processes, pathologically and clinically, and each or any one of those mentioned may be the causative factor in any form of infection. Nor can we be even certain that bacteria may be found under any given set of conditions. Thus for instance, in 20 cases of empyema of the gall-bladder associated with stones, 15 were investigated bacteriologically with the following results: Sterile 6; Bacillus coli in 3; Bacillus typhosus in 5; Staphylococcus pyogenes in 1; undentified 1. In 1 case of non-calculous empyema that was examined bacterially Bacillus coli was found. The main facts concerning the bacteriology of these cases are: (1) The difficulty of demonstrating bacteria by ordinary culture methods, even in cases of empyema. (2) The absence of any variation due to the nature of the organisms involved. (3) The frequency of the occurrence of Bacillus typhosus even in cases without a history of pre-existing enteric fever.

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[2] See: Kelly, A. O. J., Infections of the Biliary Tract, Amer. Jour. Med. Sci., 1906, cxxxii, 446, 744.

[3] These include the 70 cases previously reported by Dr. Kelly, loc. cit.

Why infection in one person should cause stone and in another cause cholecystitis of a mild grade and marked pericholecystitis, with or without adhesions, I am unable to say.

Besides infection as a causative factor in the production of gallstones, we have been able to confirm the statistics of others regarding sex and age. Thus, of 182 cases of cholelithiasis, 139 (76.4 per cent.) were females, and 43 (23.6 per cent) were males. We have noted the frequency of occurrence of gallstones in the Hebrew race.

There has been nothing to indicate the association of a family history of gastric or biliary cirrhosis in cases of gallstones, or any sign of such a thing as cholelithic diathesis, if that term may be permitted. We have been unable clinically to demonstrate the dependence of gallstones, directly or indirectly, upon errors in diet, faulty metabolism, or digestive disorders.

Pathology. The pathology of cholelithiasis is a subject of great extent, involving as it does not only an understanding of the nature of the immedate results of the formation of stones, but also of those more remote. I shall not enter upon a discussion of stone considered chemically, as this subject has already been well covered by others and has no practical bearing upon the subject at hand.

The pathological processes associated with gallstones may be subdivided into three great classes: (1) Those concerning the stones themselves and their mechanical action. (2) Those concerning the biliary passages and the liver. (3) Those entirely beyond the biliary tract.

The Stones Themselves. In considering the mechanical effects of gallstones we must take into consideration: (*a*) Their size, (*b*) their location, and (*c*) their number. The gallstones I have found at operation have been from 3 cm. in diameter, the largest, to fine sand, and in number from one to hundreds. They have been found in the gall-bladder and in the ducts in almost every combination. The appended table shows where the stones were located and also how located in special classes of cases:

Location of Calculi.

		Simple cholelithiasis.	Cholelithiasis and cholecystitis.	Simple hydrops.	Cholelithiasis and abscess.	Cholelithiasis and carcinoma.
Gall-bladder alone	107	62	34	3	5	3
Gall-bladder and choledochus	24	17	6	0	1	0
Gall-bladder and cysticus	26	11	9	6	0	0
Gall-bladder, choledochus, cysticus	2	1	0	1	0	0
Gall-bladder, choledochus, hepaticus	2	1	0	1	0	0
Choledochus only	12	9	3	0	0	0
Cysticus only	6	2	2	2	0	0
Gall-bladder, cysticus, choledochus, and hepaticus	1	1	0	0	0	0
Choledochus and hepaticus	2	2	0	0	0	0
Total gallstone cases	182	106	54	13	6	3

The most important deductions from facts in this table are as follows: (1) In cases of hydrops there was either a stone in the gall-bladder only, or in the cystic duct, at times with associated stones in the gall-bladder and choledochus. (2) In the vast majority of cases the calculi, even when causing symptoms, are found in the gall-bladder alone. (3) The rarity of finding stones in the hepatic duct, which in connection with other facts mentioned shows that, while calculi may be formed within the hepatic ducts, their point of origin is undoubtedly in the gall-bladder in most cases. In one case a calculus was found in the duct of Wirsung. This was in a case in which there were stones also in the gall-bladder, choledochus, and hepaticus, and which will be later referred to.

The mechanical action of the biliary calculi is exerted in several ways: (1) They act as foreign bodies in the gall-bladder. (2) They may obstruct the flow of bile by lying either in the gall-bladder or cystic duct and causing pressure upon the choledochus, or lying in the choledochus itself. (3) Their motion through the ducts gives rise to biliary colic. (4) By pressure upon the pancreatic duct they may obstruct the flow of pancreatic secretion and cause a pancreatitis. (5) They may cause pressure necrosis of the gall-bladder and ducts and ulcerate through either into the peritoneal cavity or an adjacent organ. (6) After passage into the intestines they may cause intestinal obstruction.

1. The action of the gallstones merely as foreign bodies is important only in the fact that in so far as they injure the gall-bladder mucosa they afford an entrance to harmful bacteria, which may cause a fresh cholecystitis.

2. The mechanical obstruction to the flow of bile is more important. When it takes place jaundice occurs. When the choledochus itself is blocked the jaundice is easy enough to understand. The jaundice in cases of stone in the gall-bladder alone or

in the cysticus may be caused in several ways: (*a*) By direct pressure upon the choledochus, as when the neck of the gall-bladder is pouched out or pressed on the common duct. (*b*) By an inflammation set up by the stone which spreads to the choledochus and causes its occlusion. The latter is by far the more common mode of action.

3. Motion of the stones causes biliary colic. This is open to dispute. While the presence of some degree of inflammation may be necessary for the occurrence of typical colic, it does not in itself seem a sufficient cause when the calculi are at rest. Colic in the gall-bladder and bile passages probably is caused as it is in other portions of the body, that is, by muscular action of the walls of a hollow viscus.

4. Pancreatitis associated with cholelithiasis is well known, and forms a grave and often intractable complication. I have noted it many times at the operating table, and it has been demonstrated several times postmortem in cases in this series. None of them showed acute pancreatitis. Chronic pancreatitis was present in 11.1 per cent. of the fatal cases.

5. Several of the cases presented perforated gall-bladders in which the lesion was caused by stone. I have seen 1 or 2 cases in which, with impacted gall-bladders, the stones were working themselves through the gall-bladder without very much apparent damage to its walls. In one case notably the stones could be picked off from the outside of the viscus without opening it and were held by but a few adhesions.

I have had no cases of gallstone ileus, but its existence and clinial features are so well known that it requires mention.

Among the pathological processes found in the gall-bladder and biliary passages, the following are the most important, all of which have been illustrated in the present series of cases:

1. Cholecystitis:—
    - (*a*) Acute.
        - Catarrhal.
        - Purulent—empyema.
        - Hemorrhagic.
        - Ulcerative.
        - Gangrenous.
        - Phlegmonous.
    - (*b*) Chronic.
        - Catarrhal.
        - Hydrops.
        - Obliterative.
2. Cholangitis.
    - Acute catarrhal.
    - Acute purulent.
    - Chronic catarrhal.

3. Hepatitis.
    Acute or purulent.
    Chronic or cirrhotic.
4. Pericholecystitis.
    Acute inflammatory.
    Acute purulent.
    Chronic adhesive.
5. Localized peritonitis with abscess.
6. Perforation of the gall-bladder.
7. General peritonitis.
8. Biliary fistula.
9. Carcinoma.
10. Pancreatitis.

Any or all of these complications mentioned may also supervene upon non-calculous cholecystitis. The divisions are important enough to be considered in detail.

Cholecystitis. Acute cholecystitis of one of the varieties mentioned is quite commonly found in cholelithiasis, especially in those cases coming to the surgeon. Indeed often it is only the setting in in of an acute inflammatory condition which induces the medical attendant to think of operation. Of the acute forms of cholecystitis, the catarrhal is perhaps the most common. Scarcely a case of cholelithiasis giving symptoms in any way marked fails to show some degree of inflammation of the gall-bladder. The mucosa is thickened, œdematous, and red; the bile thick, dark, and ropy. This condition is not grave, and with the removal of the exciting cause soon subsides.

Empyema of the gall-bladder is also quite common. In this series of 182 cases it occurred in 30, or 16.4 per cent. It was found in in cases both chronic and acute, showing itself of course as an acute manifestation in the course of chronic cholelithiasis. The bacteriology of gall-bladder empyema in cholelithiasis has also been referred to, and I would again call attention to the percentage of cases, 6 (37 per cent.) of 16 cultured, in which no bacteria were demonstrable. Empyema is an important and dangerous complication of gallstones, forming as it does the starting point for further purulent invasion, causing general sepsis, interfering with the technique of operation, and leading to peritonitis by extension and by rupture of the gall-bladder. It is fortunate indeed that the gall-bladder is capable of great distention by pus or bile. In 1 case of empyema in this series, operated upon by my assistant, Dr. Ross, the gall-bladder reached to the brim of the pelvis, and had been diagnosed as an inflamed ovarian cyst. It was about the size of an infant's head, with walls enormously thickened. The occurrence of empyema in a gall-bladder chronically contracted or pressed upon by adhesions is all the more dangerous because the pus must find new localities for extension, either into the bile passages or through the gall-bladder wall. The character of the pus in empyema varies. At times it is but a flaky cloud in the bile or bile and mucus. At times it is thin and foul, at others thick and viscid. Its powers of infection is, as a rule, marked.

Hemorrhagic cholecystitis is illustrated in 2 cases of the series in which blood clots were found floating in the thick, tarry bile. One other case showed bile stained by blood pigments, but no blood. These conditions are rare and interesting and the exact mechanism of their causation is unknown.

Ulcerative cholecystitis occurred in 10 of the cases, 5.5 per cent. The amount of ulceration varied from a small necrotic area to almost one-half of the gall-bladder, the cause being apparently direct pressure by the gallstones. Perforation occured in several of these cases.

Gangrenous cholecystitis was found in 17 (9.4 per cent.) of the cases. The gangrene varied in extent and degree. In some cases it involved the whole viscus, in others but a part. In some only the mucosa was involved, in others the entire thickness of the organ. Gangrene of the gall-bladder is often difficult to deal with at operation, as the organ cannot be either resected or satisfactorily removed; it is friable, infection is spread, and hemorrhage difficult to deal with. The use of the term phlegmonous cholecystitis by some of the English authors seems a relic of antiquated medical nomenclature, and has been used to designate an acute purulent and gangrenous process. I have included such cases among the cases of gangrenous cholecystitis. In connection with acute cholecystitis I would mention one remarkable case in which the whole mucosa of a very much diseased gall-bladder was studded with fine deposits of biliary salts. This may be an illustration of the method of formation of biliary calculi.

Chronic cholecystitis is the accompaniment of practically all those cases of cholelithiasis in which the gall-bladder is not acutely inflamed. The catarrhal form is the more common, and here we find the thick, tarry bile so significant of this condition. It disappears with the removal of the exciting agent.

Hydrops of the gall-bladder is caused by some cause closing the exit of the gall-bladder itself, the gall-bladder containing some bile is then further distended by the mucoid secretion of its walls, the bile is gradually absorbed, and there remains a clear mucoid fluid. The walls of the gall-bladder are thinned, often transparent as parchment. This fluid seems to be an excellent culture medium for pyogenic bacteria, as several of the cases of empyema have been cases of hydrops with the superaddition of pus. Hydrops occurred in 13 of the 182 cases, or 7.1 per cent. They all occurred in females, and in each case there was a stone in the cysticus or gall-bladder, generally the neck. None of the cases of hydrops upon which I have operated have reached the enormous size of some cases reported by others.

Chronic obliterative cholecystitis is, as a rule, the result of numerous attacks of acute inflammation. It is in many cases associated with chronic or adhesive pericholecystitis. The shrinking of the gall-bladder in many cases is due to the presence of stone in the choledochus; yet of 43 cases with stone in the choledochus, in 25 of which there is specific mention of the size of the gall-bladder, it was enlarged in 10, contracted in 15, a state of affairs somewhat at variance with the results of other observers. Of the 182 cases, in 30 (16.5 per cent.) the gall-bladder was contracted. The degree of contraction of the gall-bladder has varied greatly; in some cases it was slight, in others its lumen was practically entirely obliterated. In 3 cases an hour-glass gall-bladder was found. In 1 case this condition was so marked that the two parts were connected only by a fibrinous band, the stone being in the proximal portion.

Cholangitis results from the direct extension of the inflammatory process from the gall-bladder; chronic and acute cholangitis are commonly found associated with similar conditions of the gall-bladder. Acute cholangitis is responsible for many attacks of jaundice, the most, in fact, in connection with cholecystitis. Jaundice by blockage by stone is rare, jaundice in cholelithiasis due to cholangitis is common.

Acute purulent cholangitis is fortunately rare, and when it exists is practically always fatal. Two cases, not included in the above list, have been seen by me in which this was the condition operated for. They were both associated with liver abscess and stone, and both terminated fatally. In 2 cases of the 158 an acute cholangitis, with liver abscess following operation, was the direct cause of death.

Hepatitis of the acute purulent variety is the direct consequence of a similar cholangitis. When liver abscess follows cholecytitis or cholangitis the abscesses are practically always multiple and the condition fatal.

Chronic hepatitis or *cirrhosis* is found in connection with many cases of cholelithiasis. In 46, or 25.3 per cent., the liver was enlarged; in but 3 cases decreased in size. This cirrhosis of the liver is, as a rule, the direct result of a catarrhal cholangitis and the damning back of bile. I have seen nothing to suggest a reverse state of affairs, that is that there is anything in biliary cirrhosis favoring the formation of gallstones.

Pericholecystitis. The acute forms of pericholecystitis are two. One form is that in which by extension the inflammation spreads to the peritoneum, and fibrous adhesions, œdema, swelling, etc., result. This is very common, as evidenced by its result, that is, chronic adhesive pericholecystitis. It is of course in its more marked forms generally associated with purulent or gangrenous cholecystitis. Its danger lies in its extension to the general peritoneum and its after results.

Acute purulent pericholecystitis, or localized abscess, and perforation of the gall-bladder are so closely associated that they must be considered together. Of 5 cases of localized abscess, 2 showed perforation of the gall-bladder, the total number of perforations in the series. The abscesses were subhepatic and about the gall-bladder, and several showed distinct pocketings or abscesses.

Chronic adhesive pericholecystitis, the after-result of a subacute pericholecystitis, is very common; 107 of the 182 cases, or 58.7 per cent., showed adhesions. Their extent, character, and location are subject to wide variations. In some cases there are but a few, to the duodenum, stomach, liver, omentum, or colon. In other cases several or all of these structures are bound together. The importance of adhesions of the upper abdomen has not been as fully appreciated as is warranted by the symptoms to which they undoubtedly give rise. Indeed, in many cases the symptoms and gravity of gall-bladder lesions are due not to them *per se* but to the accompanying adhesions. It is easy to understand how by traction upon the pylorus or duodenum, symptoms of obstruction of the pylorus can be and are simulated, and this is doubtless the explanation of many of the cases in which vomiting is such a persistent symptom and grave complication. Indeed, in one of my cases a slight deformity of the stomach at its pyloric end was so accentuated by adhesions that after operation persistent, uncontrollable, and finally fatal vomiting took place. Traction upon the colon gives rise to impediments to the flow of detritus and food, and hence causes partial obstruction, constipation, and tympany. In several cases in this series the ducts were so involved in adhesions that it was almost impossibe to find them, and the choledochus was thus occluded also. Naturally the presence of adhesions complicates operative procedures enormously. I shall touch upon this phase of the question in discussing treatment and the indications for operation.

General peritonitis by passage of microörganisms through the gall-bladder and existing at operation caused one of the deaths. Its occurrence is due only to unnecessary and improper delay in operation, especially in cases not seen until the gall-bladder has perforated.

Biliary fistula to internal organs results when a penetrating stone or inflammatory process is so localized and confined by adhesions that it enters not the general peritoneum but a neighboring viscus. There were in the 158 cases 2 cases of fistula—1 cholecystogastric and 1 cholecystoduodenal. In each case the fistula was such that the viscus could be closed by Lembert sutures and the gall-bladder appropriately treated. There were no external fistulæ except postoperatively. A spontaneous external fistula in these days of aseptic surgery shows almost unconceivable neglect of a gallstone case.

Carcinoma of the Gall-bladder. The series includes 2 cases of carcinoma of the gall-bladder associated with cholelithiasis. I have had several previously. While the importance of carcinoma of the gall-bladder as a sequel of cholelithiasis has been pointed out by many authors, my own experience shows that it is rare, and not as Riedel asserts, the most-to-be-dreaded result of gallstones and occurring in 10 per cent. of cases. Far more important are adhesions and acute inflammations with their years of suffering or rapid death—as the case may be.

Pancreatitis is found in almost 10 per cent. of cholelithitic cases. My statistics on this point are not definite enough to give exact figures, but such is my experience. It can rarely be diagnosed definitely except at operation. I have not been able to ascertain its influence on the jaundice caused by the gallstones, nor have I been able to confirm the statements of some authors that the existence of pancreatitis leads to more severe hemorrhage than is the case in cases of gallstones not so associated.

SYMPTOMATOLOGY OF GALLSTONES. Gallstones give a variety of symptoms in endless combination. It has been stated that they do not in most cases cause symptoms. This is erroneous, I believe. More properly stated, the facts are that gallstones usually do not cause the symptoms commonly recognized as the classical ones in this condition, but by others which until recently have been misunderstood as to their diagnostic significance and minimized as to their importance.

The symptoms of gallstone disease are pain, jaundice, fever, tumor, nausea, vomiting, and, last but not least, that group of symptoms occurring in cases of cholelithiasis often long before the recognized signs and vaguely classified as stomach and liver trouble, biliousness, and indigestion. The classical symptoms are so well known, and their typical course so easily recognized, that diagnosis in their presence is not dificult. The symptoms singly considered are:

Pain is the most constant symptom of cholelithiasis. It was absent in but 3 of the 182 cases, or 1.6 per cent., that is, absent in any form whatever. But while present, as this shows, the pain varies greatly in different cases. The typical "biliary colic" of the text books is certainly not found in most cases, though it is frequent. There has been of late some disposition to minimize pain as a constant symptom. My experience has been that sharp pain in the epigastrium or gall-bladder region, referred in many cases to the shoulder, back, or chest, is the one cardinal sign of gall-bladder disease in its chronic form. 164 cases (90.1 per cent.) of this series had pain variously described as spasmodic, sharp, sudden, or cramp-like in the regions described. I take this pain to be a true colic caused by muscular contractions of a gall-bladder or ducts upon contents either solid or fluid. In many cases a very careful history was required to elicit the history of this pain, as it occurred often long before the true nature of the disease was suspected. 16, or

8.8 per cent., of the cases had dull pain only in the epigastrium or gall-bladder region, which was variously described as dull, burning, gnawing, or a sensation of heaviness.

Tenderness as a variety of pain I have not found with that constancy referred to by some authors, notably Moynihan. Many of my cases have certainly shown no tenderness whatever in the gall-bladder area. Tenderness becomes, however, a marked symptom when cholecystitis, cholangitis, and localized peritoneal irritation are present.

When cholecystitis occurs, the tenderness is found to be closely confined to the gall-bladder area itself and severe or slight according to the degree of acuteness of the inflammatory condition. As soon as a local peritonitis occurs or a local peritoneal irritation sets in the tenderness at once becomes exquisite and its extent then becomes that of the whole right upper quadrant of the abdomen. The associated muscular rigidity also becomes a much more marked feature. This rigidity is often such as to preclude accurate examination of the patient locally. Tenderness over the liver itself, when slight, suggests merely a congestion of that organ; when marked and associated with other symptoms it suggests a purulent invasion of the bile passages or localized or multiple hepatic abscess.

Jaundice. This symptom of late has been discredited by many authors. Murphy, of Chicago, for instance, states that he has found it in but 10 per cent. of his cases. To my mind such statements are often based upon imperfect histories. My experience has shown me that about three-fourths of the cases at some time or other have jaundice, or, accurately, of the 182 cases, 69.9 per cent. had jaundice. In fact, 90, or 49.4 per cent., had jaundice at the time of operation. The jaundice, it is true, is not always marked, being confined in many cases to icterus so slight as to be seen only in the sclera. Nevertheless it is true jaundice, and to be distinguished with care clinically from that sallowness of the skin so commonly associated with many biliary disorders and faulty metabolism of various kinds. The jaundice in cases of cholelithiasis varies from time to time, and at many times clears up entirely; yet next to pain it is certainly the most reliable cardinal symptom.

Jaundice, as a rule, follows the colic or pain; in some rare instances it is the first symptom. In the history of many cases of cholelithiasis jaundice is found to be present at one attack and not at another, or marked in one and not in another. Its degree does not bear any direct ratio to the severity or the nature of the pain. The mechanism of its causation has already been discussed.

Accompanying jaundice there are three clinical manifestations essentially identical, that is, biliuria, absence of bile from the stools, and itching of the skin. Biliuria is easily explained, of course; it is not always present, and is marked only in the graver and more persistent forms of jaundice. Absence of bile from the stools is most commonly associated with stone in the common duct, yet not by any means exclusively so; thus we note that in 13 cases of hydrops clay colored stools were noted in 2. Itching of the skin may either accompany the icterus or precede it. It is probably due to the deposit in the layers of the skin of foreign products normally excreted or secreted in the bile.

Nausea and *vomiting* often follow the acute attack of pain, at times are simultaneous and rarely precede the pain. The pain is often relieved by their occurrence. The causation of these symptoms is doubtless reflex and their occurrence is not one of the more marked features of cholelithiasis, though it is very common. Fever is another symptom of marked yet not paramount importance. Its presence helps us in a diagnosis; its absence, however, is not significant. The fever in non-infectious gallstone cases, when it is not essentially septic in origin, may precede, accompany, or follow the onset of biliary colic, or be entirely independent of it. The temperature rises rapidly, remains stationary a few hours, and rapidly falls, the interval between these elevations being entirely afebrile. Certain authors, notably Moynihan, have professed to find in this temperature a pathognomonic curve or angle. With this I cannot absolutely agree. I have found such temperature angles simulating or simulated by fever in a variety of infections and find it in nothing absolutely peculiar to gallstone disease. The fever is often accompanied by a rigor, slight or severe as the case may be. Often the rise in temperature and the rigor are represented only by a slight chilly sensation creeping over the patient.

The presence of fever with chills has been described by many observers as being peculiarly frequent in cases of stone in the common duct, yet while this has been my experience, I have also noted its presence in many other cases of cholelithiasis, so that it is not an absolutely sure point in the diagnosis of the various forms of cholelithiasis.

Tumor or the presence of an appreciable mass in the gall-bladder region is a valuable sign, more especially in those cases of cholelithiasis in which there exist hydrops, empyema with distention, or many pericholecystic adhesions. In cases of an acutely inflammatory nature the definite palpation of a mass is often made impossible by the muscular rigidity and diffuse tenderness accompanying the condition. Thus in simple hydrops, of 13 cases, in 6 cases the gall-bladder was definitely palpable, although in several others a sense of resistance in the gall-bladder region was noted. In several instances in this series of cases the gall-bladder, filled with stones, was palpable, the stones being distinctly noted. The diagnosis of the presence of calculi in this manner is, however, very rare.

The tumor formed by an enlarged gall-bladder may be confused with several things, notably movable kidney and tumors of the pylorus. A distended gall-bladder moves with respiration, and is thus distinguished from a kidney. Its upper extremity is fixed when compared to the lower pole, which often has a pendulum motion from side to side. A movable kidney when replaced, with the patient in a recumbent position, remains in place. An enlarged gall-bladder remains there only so long as the pressure is directly continued. Tumors of the stomach must be differentiated by their position, the fact that they do not move with respiration unless closely adherent to other structures, and by their evident separation from the liver itself. The rarer forms of tumor simulating an enlarged gall-bladder in most cases cause symptoms showing them to be situated in other organs. It may be noted that the absence of a palpable gall-bladder does not of necessity signify that this organ is not enlarged, as when the gall-bladder lies deep beneath the liver, or is covered by a thick abdominal wall, it often cannot be made out even when of considerable size.

Indigestion. We now come to the group of symptoms referred to as those of "Indigestion" which are so prominent in gallstone disease. "Chronic indigestion," the bugbear of so many physicians and lifelong companion of so many patients is at last, by the efforts of the surgeons, coming to be understood. Many cases are found to be due to organic disease of the stomach, notably chronic gastric ulcer. Many others, again, are found to be due to gallstones.

We have noted the existence of chronic indigestion in 44 of 182 cases, or 24.2 per cent. It manifests itself notably in epigastric distress and heaviness, often, and indeed in most cases, more or less independent of the ingestion of food. In some cases, however, it seems to depend directly upon it, and the patient often has sour eructations, slight nausea, and heartburn. These cases are exceedingly intractable, in fact not amenable to ordinary medical treatment at all.

It is probable that in the majority of cases in which these symptoms are associated with cholelithiasis they are due principally to the pericholecystic, perigastric, and pericolonic adhesions which come into existence as a result of the biliary lesion. This being the case, it is easy to see that in cases of this kind, in which so-called classical symptoms of cholelithiasis play a minor role, diagnosis is most difficult. This is the case because adhesions of the upper abdomen, no matter how caused, will give practically the same symptoms. They are also closely simulated in many cases of chronic gastric and duodenal conditions, so that they must be most carefully studied in order to be of value. The symptoms mentioned all occur in cholelithiasis independent of complications.

The various conditions often associated with gallstones have their own symptoms, which it is not my purpose here to do more than refer to. The symptoms mentioned are those we must make use of to diagnose gallstones early, before the onset of those complications which render gallstone disease so grave.

There is no especial difficulty of diagnosis in most cases of cholelithiasis in which there is an acute cholecystitis or pericholecystitis, or a purulent subhepatic collection. But then the proper time for a diagnosis has passed. The stones should have been removed long before the complications began, not left until they are almost beyond control. Before speaking of differential diagnosis it would be well to refer to non-calculous cholecystitis.

Non-calculous Cholecystitis.—The bacteriology and pathology of this condition have already been spoken of in connection with calculous cholecystitis. The pathology is practically identical in the two forms of cholecystitis, but although the pathological findings are similar, the method of their causation is different. Of 33 cases of non-calculous cholecystitis, 28 were chronic, 5 acute; of the latter, 3 were empyemas.

Cultures in 1 case of empyema showed Bacillus coli, in the other 2 no cultures were made. Of the remaining cases, 15 chronic ones and the other 2 acute ones had cultures made. Of these, 5, or 29.4 per cent., showed Bacillus coli, 12 were sterile. We may note here that Bacillus typhosus was not found in any instance, although 11 cases, or 31.4 per cent. of the total number, had had enteric fever. The pathological findings correspond to those in calculous cholecystitis.

The symptomatology in non-calculous cholecystitis very much resembles that of the more obscure forms of calculous disease and indeed often cannot be differentiated therefrom. In those cases in which I have operated for stone on what appeared to me to be an almost certain diagnosis and have been deceived, I have in most instances found a chronic cholecystitis, most often of the variety with pericholecystic adhesions.

Thus, of 30 cases of non-calculous cholecystitis, 12, or 34.3 per cent., were jaundiced at operation, while but 7, or 20 per cent., had no history of jaundice whatever.

Twenty-three, or 65.4 per cent., had had colicky pains, and in no instance had pain been absent altogether. In 9, or 25.4 per cent., the existence of a chronic indigestion had been noted. 5, or 14.3 per cent. had pancreatitis.

Laboratory Methods.—Those at our command in the diagnosis of calculous and non-calculous cholecystitis are: (1) The leukocyte count, (2) the *x*-rays, (3) the examination of the feces.

From the last two mentioned I have never been able to get results which would warrant me in regarding them as of any great value. The *x*-rays especially have been a source of continued disappointment in the diagnosis of gallstones.

The leukocyte count is certainly of some value, especially in purulent conditions of the biliary passages. I certainly cannot agree with Ewald and many others who have from time to time asserted that empyema of the gall-bladder does not give a hyperleukocytosis. In 28 cases of empyema in calculous cholecystitis

35 counts were made. The minimum was 3200, the maximum 32,600, the average 11,900. In 3 cases of non-calculous cholecystitis in which empyema existed, the average leukocyte count was 11,400. Thus we can see that while the leukocyte count in empyema varies greatly, it is considerably above the normal in most cases, and certainly is of value. It is also of use in differential diagnosis of the various forms of cholelithiasis. In simple cholelithiasis the leukocyte count in 104 cases rose over 10,000 in but 14 cases, and the maximum was 17,700; a considerable difference between the leukocyte count in empyema and uncomplicated cholelithiasis is at once noted.

Bearing in mind all the diagnostic features mentioned, it is evident that while the diagnosis of gallstones is in the more obscure cases a matter of great difficulty, in most cases the recognition is easy. This is so especially if the physician knows how to take a careful history and what symptoms to look for, and does not simply base his diagnosis upon the symptom-complex described in the ordinary text-books as the classical one in gallstone disease.

The difficult diagnoses are those in which the original disease is masked in its pathology and symptomatology by the existence of adhesions of the upper abdomen; then the distinction between gallstone and chronic gastric ulcer, or stone and non-calculous cholecystitis, often becomes a very fine one.

Among the diseases which occasionally cause us difficulty in the diagnosis of gall-bladder disease there are, besides those already mentioned, appendicitis, renal calculus, gastric crises in certain nervous affections, and many others. In all of these cases a careful study will generally clear the diagnosis without much difficulty.

The differential diagnosis between the different forms of cholelithiasis considered as to location of the stone or lesion it is not my purpose to present at this time. It is a subject as yet not upon a very firm basis. I would, however, impress the necessity of at once recognizing the presence of acute complications in those cases of cholelithiasis which for one reason or another do not come to the surgeon, but must be treated by the medical man.

Treatment. The medical treatment of cholelithiasis or of cholecystitis must of necessity be palliative, indirect, long continued, and uncertain; permanent relief to the patient can come only by surgical intervention. The medical treatment of calculous cholecystitis is limited to the relief of pain in the acute attacks and to efforts to keep the stones quiescent in the intervals. I know of no remedial measure for the solution or removal of biliary calculi. The surgical treatment of these diseases concerns us more directly. Surgery of the biliary passages is now firmly established. For a reason for its existence we have only to look at the long list of complications of gallstones in the neglected cases.

Its consideration may be divided briefly into parts: (1) The indications for surgical intervention. (2) The results of surgical intervention. (3) The contra-indications for surgical intervention.

1. *The indications for surgical intervention* in cases of gallstones I consider to be as follows: (1) Repeated attacks of biliary colic. (2) Hydrops of the gall-bladder. (3) Stone in the common duct. (4) The existence of any of the complications, especially of the acute infections. The first three of these conditions do not demand immediate operative procedures in all cases; the last nearly always does. The diagnosis of gallstones is not of necessity an indication for operation, yet many attacks should not be permitted to occur; else the pathology becomes vastly more complicated and the patient's chances much poorer. I have had but one case in which, after gallstones had been passed, absolutely none were found at operation, either in the gall-bladder or the bile ducts. Spontaneous cure in cases of cholelithiasis then is rare; cure by medicines impossible. The same is true in the case of adhesions. Surgery offers these patients their only chance of ultimate cure, and is the treatment of choice, and of safety where no complications exist.

2. *The Results of Surgical Intervention.* These fully warrant its use. Of the 217 cases of biliary disease in this series, with all conditions included, that came to operation, 30, or 13.8 per cent., died. These are to be subdivided as follows: Of the 182 cases of cholelithiasis, 27 died, or 14.8 per cent. Of the 35 cases of non-calculous cholecystitis, 3, or 8.5 per cent., died. The mortality in cholecystostomy in simple cholelithiasis in 45 cases was but 4.4 per cent., and in all cases of stone (except hydrops) in which there was not acute inflammation it was 10.6 per cent., 11 cases in 104. In cholelithiasis with acute cholecystitis, 10 cases out of 54, died or 18.5 per cent. In cholelithiasis with abscess, 2 of 6, or 33.3, per cent. died. In hydrops, 3 of 12, or 25 per cent., died.

These mortalities are low when we consider that the cases include all the severe infections, with 31 empyemas and 17 cases of gangrene, the chronic cases with many adhesions, deep jaundice, and even those operated on as a last resort when almost moribund from cholemia. In addition I have operated upon 3 patients not in the above series, in which the indication for operation was an acute diffuse cholangitis; 2 had gallstones, 1 did not. They all terminated fatally.

These mortality statistics point most strongly to the comparative safety of early operation and the high mortality in cases complicated by purulent infection or chronic cholemia.

As to the nature of the operation performed, I may state that in cholelithiasis there were performed, in 182 cases:

	Cases.
Ideal cholecystotomy in	4
Cholecystostomy in	72
Cholecystostomy and choledochostomy[4] in	34
Cholecystectomy in	36
Cholecystectomy and choledochostomy	29
Choledochostomy	5
Cysticus drainage	1
Cholecystenterostomy	1
Total	182

Before considering the contra-indications to operation it might be well to consider the causes of death in the fatal cases. Of the 25 cases of cholelithiasis that died as a result of operation, 10 had acute cholecystitis (including empyema), 2 had abscess outside of the gall-bladder, and 1 had carcinoma. These conditions alone were very unfavorable, and in all probably the result of too great delay in bringing the patient to operation.

Six patients had conditions in addition to the local gall-bladder disorder unfavorable to recovery: One fatal case was in a subject seventy-nine years old who had had lobar pneumonia twelve weeks prior to operation; another occurred in a subject sixty-eight years old. One patient was a chronic alcoholic. Another was markedly anemia (the hemoglobin percentage being 41). Adiposis and myocarditis were marked in one case. Myocarditis and cholemia were present in one case of chronic choledochus obstruction.

The direct causes of death in the 27 cases were: Uremia in 3; hemorrhage in 4; primary shock in 8—of these, 4 were septic and 1 cholemic; exhaustion in 3; sepsis in 1; general peritonitis in 1; anesthesia in 1; liver abscess and cholangitis in 2; malformation of stomach and vomiting in 1; secondary shock in 1; general peritonitis following pneumonia in 1; cause unknown in 1.

3. *The contra-indications to operation* may then be summarized as follows: Organic lesions of the heart, lungs, and kidneys; extreme age; anemia or slow coagulability of the blood; and cholemia.

The main features concerning surgical treatment which must be borne in mind are these: that it is absolutely necessary to a cure in most cases of chronic biliary infections, whether calculous or non-calculous, and that when undertaken early the risks are infinitesimal compared to those encountered when complications have set in. A knowledge of the contra-indications and failures should not deter us from operation, but lead us to operate earlier and oftener in suitable cases. The permanent cures thus will be greatly increased and the mortality correspondingly lowered.

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[4] In double operations choledochostomy is used to include hepatics or cysticus drainage.

RUPTURE OF THE KIDNEY, WITH REMARKS UPON CONSERVATIVE OPERATIVE TREATMENT.[1]

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The object of this contribution is to place upon record 4 cases of subparietal injury of the kidney which have been met with in my experience at the Episcopal Hospital, Philadelphia, and which were treated surgically by conservative measures, and to consider the question of the employment of such means rather than the radical one of nephrectomy, when possible, in the treatment of this class of injuries.

Case I.—*Rupture of the left kidney with laceration of the peritoneum and severe hemorrhage into the abdominal cavity; fracture of the tenth rib; laparotomy and lumbar incision; gauze packing; recovery.*

Jacob B., aged twenty-five years, a farm hand, was admitted to hospital at 3.30 a.m., on April 14, 1901. Late in the afternoon of the preceding day he fell from and was run over by a heavy farm wagon which he was driving.

On admission the patient complained chiefly of pain in the left chest, and stated that he had passed bloody urine. The abdomen was markedly distended and the muscles rigid, especially in the lower part. Examination further disclosed a fracture of the tenth left rib near its angle. The only visible marks indicating that the man had been run over were a contusion in the left axilla and an abrasion of the left arm. The temperature was 99°, pulse 80, and respirations 40. Later in the morning some fourteen ounces of bloody urine was obtained by catheter. It was found that the patient had a stricture of the urethra, the result of traumatism some years previously, and for several days after admission, until dilatation had partly relieved the condition, the catheter had to be relied upon entirely.

I first saw the man toward evening on the 14th, about twenty-four hours after the injury. The pulse had then become more frequent, the countenance pinched and anxious; there was abdominal pain and the distention had increased, and hematuria continued. I decided upon immediate operation.

Opening the abdomen by an incision through the outer border of the left rectus muscle, I found a great quantity of blood and clots in the peritoneal cavity, and on searching for its source quickly discovered a tear in the peritoneum over the left kidney which was ruptured and bleeding. Placing a pad of gauze firmly over the kidney to control temporarily the hemorrhage, and finding no intro-abdominal organ injured, the abdominal incision was closed after mopping out the blood and clots and inserting a glass drainage tube in the pelvis. The patient was then turned on his right side, and the left kidney exposed by an oblique lumbar incision. A large amount of blood and clots distended the region about the kidney, and were removed, and the kidney was found to have been lacerated in several places, mostly in its lower half. Strips of iodoform gauze were firmly packed about it, controlling the hemorrhage, and the angles of the wound sutured. While on the operating table the patient's condition became so bad, that, in addition to free hypodermic stimulation, normal saline solution was given both by intravenous transfusion and by hypodermoclysis.

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[1] Read at a meeting of the American Surgical Association, Washington, D. C., May 7, 8, and 9, 1907.

After operation the pulse was 124, and the temperature 99.4°. During the night the condition twice became alarming from symptoms indicating œdema of the lungs.

During the next two days the pulse varied from 130 to 144, and the temperature rose once to 101.6°. Thereafter both gradually fell, the chart showing nothing of especial interest.

The urine, the day following operation, contained a large amount of flocculent sediment of the color of iron rust; there were a moderate trace of albumin, a considerable number of red corpuscles, and a few granular casts. On the 19th, it was noted that it was slightly acid, contained a faint trace of albumin, a few clumps of pus cells, and numerous bacilli. On the 22d, it was alkaline, contained more pus cells and very numerous bacilli. On the 23d, a culture from the urine (still drawn by the catheter) was made, and the organisms were found to be streptococci and the bacillus aërogenes. Shortly thereafter the number of bacteria became greatly reduced, salol having been given for a number of days. The urinary infection was more than likely produced by the catheter.

The general condition improved steadily from the third or fourth day, by which time abdominal distention had disappeared. The abdominal drainage tube was then removed, the incision healing without incident. From the lumbar incision there was rather profuse colorless discharge (urine) by the fifth day; this continued in quantity for several days. The gauze packing was entirely removed by the tenth day, and a wick of gauze was inserted to maintain drainage. The fistulous tract closed quite slowly, but finally healed soundly, the patient being discharged from the hospital on July 17.

Case II.—*Rupture of the right kidney with laceration of the peritoneum and hemorrhage into the peritoneal cavity; laparotomy and lumbar incision; gauze packing; death from secondary hemorrhage.*

Paul F., aged sixteen years, was admitted to hospital on the evening of June 4, 1904. While playing ball in the street he ran in front of a trolley car, the fender of which struck him in the right hypochondriac region and on the head.

On admission there was found an ecchymosis of the upper right side of the abdomen and a contusion of the right side of the head and face. The boy was pale, his pupils dilated, but responding to light. The pulse was 100 and the temperature 100.4°. There was some abdominal pain and distention, but no muscular rigidity. Bloody urine was voided. Vomiting occurred during the night. Under stimulating treatment the condition improved.

By the next day the general condition was much improved, and the boy suffered less pain.

On June 9 the patient complained of great abdominal pain, and tenderness in the lumbar region had increased. In view of these symptoms I operated, choosing the abdominal route.

The abdomen was opened through the right rectus muscles. No visceral injury was found, but there was a small quantity of blood in the peritoneal cavity coming through a tear in the peritoneum overlying the right kidney, the region about which was distended by a large hematoma. Closing the abdominal wound I exposed the kidney by an oblique lumbar wound. The removal of blood and clots was followed by a great gush of blood which was controlled by the introduction of iodoform gauze packs about the kidney. The organ had been nearly bisected by a transverse tear somewhat above its middle.

After operation the patient's condition was very bad, the pulse being 160. Reaction, however, took place, though slowly, and in forty-eight hours the condition was decidedly improved. Some bloody oozing into the dressings occurred. The temperature rose on the second day to 103°, but shortly afterward a gradual fall took place; the pulse also came down at the same time. The patient did very well, although some urine escaped from the wound, until June 22.

On that day in the forenoon, the balance of the gauze packs were entirely removed by the resident physician. At 12.30 P.M., on visiting the ward, I was struck by the pallor and restlessness of the boy, and going to the bed-side and lifting the sheet I found that he was bleeding badly from the wound, the dressing being saturated and a quantity of blood in the bed. The wound was quickly and firmly packed with gauze, which controlled the hemorrhage; intravenous transfusion of normal saline solution was given, and free hypodermic stimulation employed. The patient's condition forbade any attempt at immediate operation, but I hoped that reaction might occur sufficiently to permit nephrectomy to be done. No improvement took place, however, and the boy died at 8.30 P.M.

CASE III.—*Rupture of the right kidney; fracture of the tenth and eleventh ribs and of the transverse processes of the first and second lumbar vertebræ; lumbar incision; gauze packing; recovery.*

Barney McG., aged fifty years, a laborer, while at work at a coal wharf, was struck in the back by a heavy iron bucket. He was brought immediately to the hospital, where he was admitted in the afternoon of December 17, 1904.

Examination disclosed a large hematoma in the right lumbar region, which was exceedingly tender. The patient voided urine containing a large amount of blood. A diagnosis of ruptured kidney was made, and I operated immediately.

Making an oblique lumbar incision, the kidney was exposed and delivered. There were a number of lacerations of the convex border and of both the anterior and posterior surfaces, as well as several contusions. The transverse processes of the first and second lumbar vertebræ and the last two ribs were fractured, and the hematoma was found to extend between the muscle planes of the loin. While the pedicle of the kidney was firmly held, preventing hemorrhage, loose fragments of bone were removed and the sharp bases of the fractured transverse processes of the lumbar vertebræ were cut off with bone forceps. Iodoform gauze packs were then placed carefully about the kidney, which was returned, and the wound was sutured in part. After operation the bladder was washed out, and there is no note of any recurrence of hematuria.

The highest temperature recorded after operation was 101° on the second day, and the pulse rose no higher than 118, the first observation after operation. During the first seven days the smallest amount of urine voided was 26 ounces on the third day, the largest, 56 ounces, on the seventh. During the first forty-eight hours there was some bloody oozing into the dressing.

The progress of the case was satisfactory thoughout, and the patient was discharged on February 11, 1905, with a small sinus remaining, but no urine excaped from it.

Case IV.—*Rupture of the left kidney; lumbar incision; gauze packing; recovery.*

James A., aged six years, was admitted to the hospital on May 4, 1905, having fallen from a pile of lumber upon which he was playing. He was brought at once by his mother to the dispensary of the hospital, where his condition was found to be such that he was sent to the receiving ward.

On admission, his appearance indicated shock. His lips were pale, but the pulse was, however, only 96, and the temperature normal. There was no mark of injury to be seen, but the child complained of pain and was tender to pressure in the left lumbar region. Bloody urine was obtained by catheter.

When I saw the boy, not long after his admission, I determined that his condition was due to hemorrhage from a rupture of the kidney, and operation was promptly done.

Opening the loin by an oblique lumbar incision, the kidney was exposed and delivered; a quantity of blood and clots was removed from the surrounding tissues. There were many small tears of the convexity and anterior surface of the organ, but it was most severely injured at its lower pole from which quite a large piece was entirely detached. This was removed. Iodoform gauze packs were placed over the lacerations, and the kidney was replaced and held firmly by hammock strips of gauze at its poles. The wound was partly closed by silkworm-gut sutures.

The next day the patient's temperature rose to 101.8° and the pulse was 148. Bloody oozing saturated the dressings and the child had two severe convulsions, the nature of which was not noted. Thereafter he did very well, both temperature and pulse gradually becoming normal. The daily amount of urine voided during the first week varied from 15 to 20 ounces. On the ninth day the packing was removed from about the kidney, no bleeding occurred, and a small gauze drain was inserted. Several days later it was noted that there was a slight discharge of urine from the wound, but this lasted only for a few days.

On June 24 the boy was discharged, the wound being completely healed.

In connection with these cases mention may be made of an instance in which a severe rupture of the liver was associated with rupture of the right kidney, hemorrhage from both organs being controlled by gauze tampons. This case occurred also in my service at the Episcopal Hospital, and was reported to the Philadelphia Academy of Surgery, in April, 1903.[2]

The patient was a man, aged twenty-six years, who, while engaged in decorating a church fell from a step-ladder a distance of ten feet, striking his right side upon the end of a pew. With assistance he was able to walk home where he remained until the morning of the third day after his injury, when he was admitted to the hospital. During the sixty hours preceding admission there had been pain over the lower right ribs, distress from accumulation of gas in the stomach, some general abdominal distention, hematuria, and twice hematemesis.

At the hospital the man's condition was found to be clearly indicative of hemorrhage: pallor of the lips and conjunctivæ, pulse 120 and scarcely perceptible, temperature 97.5°. There was tenderness in the right upper quadrant of the abdomen with rigidity of the rectus muscle; the liver dulness extended two and a quarter inches below the costal margin; the patient once vomited a small quantity of blood and voided bloody urine. The leukocyte count was 12,000.

Stimulation by tincture of digitalis and strychnine hypodermically, and normal saline solution by hypodermoclysis was employed, before operation, which was done a few hours after admission.

While the hematuria pointed to a renal lesion, the localized abdominal tenderness with rigidity of the upper part of the right rectus muscle and the increase in the liver dulness indicated injury of the liver, and accordingly the abdomen was opened through the right rectus muscle.

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[2] Annals Surg., 1903, xxxviii, 121.

A large amount of blood and clots was found in the abdominal cavity, the hemorrhage having occurred from a number of lacerations on the upper and lower surfaces and the posterior border of the liver, as well as from the upper pole of the right kidney which was also ruptured and bleeding into the abdomen through a rent in the peritoneum overlying it. Hemorrhage from both organs was effectually controlled by iodoform-gauze tampons placed firmly against the lacerations. To afford thorough drainage a second wound was made posteriorly between the eleventh and twelfth ribs, and one end of each gauze pack was carried through it. Recovery without incident occurred, the patient being discharged from the hospital fifty-one days after operation.

The literature of the subject of renal injuries, since the publication in 1878 by Maas,[3] of Freiburg, of a study of 71 collected cases, has grown, through the contributions of many writers, until it may be considered, in view of the infrequency of such cases in individual experience, to have reached fairly abundant proportions. Before the American Surgical Association, in 1896, W. W. Keen[4] read a paper with tables of 155 cases, not including those of Maas. In the same year Küster[5] published a study of 306 cases. In 1899, Tuffier,[6] contributed an investigation into 198 cases. Delbet,[7] in 1901, went over the literature and analyzed 320 cases. In 1903, Francis E. Watson,[8] wrote a most admirable, exhaustive, and analytical paper based on 660 cases, including all published up to June of that year, 6 being cases of his own. In February of the present year, A. H. Barkley[9] published a "Tabulation of Cases and Bibliography of Ruptured Kidney," comprising 95 cases. Of these, however, all but 16 are included in the period covered by Watson's paper. In addition to these 16 cases published since June, 1903, given in Barkley's table, I have been able to find in the literature, from that time to date, reports of 14 more, which, with the 4 here reported, make a total of 34 cases recorded since Watson's paper. The 14 cases alluded to have been reported by Mathieson,[10] Riddell,[11] C. A. Smith,[12] Cahen,[13]

[3] Deutsche Zeitschr. f. Chir., 1878, x, 126.

[4] Trans. Amer. Surg. Assoc., 1896, xiv, 293.

[5] Die Chir. Krankh. der Nieren. Deutsche Chir., Lief. 52b., 196, Stuttgart, 1896.

[6] Duplay et Reclus' Traité de Chirurgie, 2d Ed., 1899, vol. vii, 164.

[7] Ann. des mals. des org. genito-urin., 1901, xix, 669, 805.

[8] Boston Med. and Surg. Jour., 1903, cxlix, 29.

[9] Louisville Monthly Jour., Med. and Surg., 1907, xiii, p. 307.

[10] Quart. Med. Jour., Sheffield, 1902–03, xi, 134.

[11] Scot. Med. and Surg. Jour., Edin., 1903, xiii, 54.

[12] Northwest Med., Seattle, 1903, i, 385.

[13] Münch. med. Woch., 1903, l, 2205.

Mauclaire,[14] Chaput[15] (3 cases), Edington,[16] Michel,[17] Ninni,[18] Franklin,[19] C. B. Keetley,[20] and M. B. Miller.[21]

A study of these papers, tables, and case reports has been made with the object in view of ascertaining the results of surgical treatment of rupture of the kidney by packing, drainage, or suture of the renal wound, as compared with those of nephrectomy, and of determining the limitations within which conservative treatment may properly be employed. At the outset it is obvious that the comparison is not entirely a fair one, since it has to deal with the results of injuries which, in different cases, vary in extent, and which may or may not be associated with other and often grave injuries, as laceration of the peritoneum with hemorrhage into the abdominal cavity, injury of the abdominal viscera, or injuries of other parts of the body, themselves threatening life.

The highest mortality in subparietal injuries of the kidney is found in the cases not treated by surgical measures. Watson's analysis gives 270 cases, without complication, subjected to expectant treatment, with 81 deaths—mortality 27 per cent.; and in 56 with complications, and treated expectantly, there were 51 deaths—mortality 91 per cent. Keen, comparing the results of cases in which nephrectomy was done with those in which it was not, found a death rate in the former of 36.4 per cent., and in the latter 44.2 per cent.

As to the comparison between the results of treatment by conservative operation and those of nephrectomy, Watson's statistics favor the former procedures. Thus, he found that in 99 cases free from complication, treated by operations other than nephrectomy, there were but 7 deaths—mortality 7 per cent.; and that in 15 complicated cases so treated there were 7 deaths—a mortality of 46 per cent. In 115 cases not complicated and treated by nephrectomy, there were 25 deaths—mortality 21 per cent.; and in 45 cases having complications, 19 deaths or a mortality of 42 per cent.

From the 34 cases, including those herewith reported, added to the literature since the publication of Watson's paper, the following statistics are obtained:

CASES WITHOUT COMPLICATIONS.

Treated by conservative operation.	Cases.	Deaths.
Lumbar incision, suture of renal wounds, with drainage	2	0
Lumbar incision, gauze packing or drainage.		
Primary	5	2
Secondary	1	0
Nephrectomies.		
Lumbar primary	6	2
Lumbar secondary	5	2
Abdominal, primary	5	1
Abdominal, secondary	1	0

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[14] Bull. et. mém. Soc. anat. de Paris, 1904, lxxix, 332–336.

[15] Bull. et mém. Soc. de chir. de Paris, 1905, N. S. xxxi, 402.

[16] Glasgow Med. Jour., 1905, lxiii, 84.

[17] Rev. méd. de l'est, Nancy, 1905, xxxvii, 84.

[18] Gior. internaz. d. sc. med., Napoli, 1905, N. S., xxvii, 635.

[19] Amer Jour. Surg., 1906, xx, 309.

[20] West Lond. Med. Jour., 1906, xi, 110.

[21] Annals Surg., 1907, xlv, 306.

CASES WITH COMPLICATIONS.

	Cases.	Deaths.
Gauze packing and drainage.		
Primary	2	0
Secondary	1	0
Nephrectomies.		
Lumbar, primary	2	0
Abdominal, primary	4	2

Of the 11 cases treated by gauze packing, suture of the kidney, or drainage, 2 died—mortality 18.1 per cent. The causes of death were, shock and collapse in 1 case, secondary hemorrhage in the other.

Of the 23 cases in which the kidney was removed 7 died—mortality of 30.4 per cent. The causes of death were: suppression of urine, 2; septicemia, 1; shock and hemorrhage, 2; peritonitis, 1; not stated, 1.

The showing in cases not dealt with by nephrectomy is so favorable as compared with those in which the organ was removed that it cannot fail to attract attention. It may be said that probably the difference is largely due to the fact that in the cases so treated the kidney was less severely injured than it was in those included in the other group. This, however, does not apply to many of the cases, for in some of them which I have studied, the kidney had suffered greater traumatism than in some of those in which nephrectomy was done.

Surgical interference in rupture of the kidney is called for, in the first place, for the control of the hemorrhage and the prevention of extravasation of blood or of urine into the tissues, or into the abdominal cavity, in case the peritoneum be torn; second, for the treatment of injuries of other organs which may have occurred in addition to that of the kidney; third, to place the injured kidney, whenever possible, under circumstances most favorable to repair; and, fourth, to provide means against the occurrence of infection.

When there are sufficient grounds for belief that hemorrhage is taking place—lumbar tumefaction, severe or persistent hematuria, evidence of fluid in the abdomen, with constitutional proofs of bleeding, or if, in addition to indications of lesion of the kidney, there be signs indicating the possibility of injury of the intestines or other abdominal organs—operation should be done without delay.

So-called expectant treatment is permissible only in cases in which the local symptoms are insignificant, constitutional symptoms absent, and slight hematuria alone directs attention to the probability of renal injury. Of cases of this type there are not a few, and to their almost invariable recovery can be given the largest share of the credit due to non-surgical treatment.

When operation is to be done, the choice as to whether the abdomen should be opened or the renal region alone exposed by lumbar incision must be made after consideration of the symptoms presented in individual cases. Rigidity of the abdominal muscles with general or localized renderness, or dulness in the flanks on percussion, if present in addition to tumefaction and tenderness in the lumbar region, should make the decision in favor of laparotomy; while the absence of signs except in the lumbar region or the predominence of the latter, indicate lumbar incision as the proper course to pursue. Should abdominal section be done the loin also should be opened to provide for dependent drainage, whether the kidney be removed or not.

Should lumbar incision be chosen, the kidney having been exposed and brought out of the wound, blood and clots having been first removed from the surrounding region, hemorrhage temporarily controlled by pressure of the organ or its pedicle, and the extent of the injury ascertained, the question arises as to whether or not the organ may be spared. In those instances in which violence has been so great as to pulpify it completely, or for the most part, no more doubt as to the necessity of its removal can be entertained than could arise if the kidney be found entirely severed from its pedicle. Likewise nephrectomy should be done if one of the main vascular branches has been torn, fatally interfering with the circulation in a large portion of the organ. And again, no other course of action should be considered but the removal of a surgically diseased kidney, if ruptured.

But other cases will occur in which a single, or even two clean tears nearly or quite divide the kidney, and others, more in number, having several or many more or less deep lacerations and contusions at other points, in which an effort to save the organ is justified. The ease and promptness with which repair of wounds of the kidney takes place is well recognized. It is relied upon in our operations of nephrotomy, whether done for the removal of stone (in which cases more than one wound through the substance of the kidney is not seldom made), or for other causes.

It seems, therefore, to be entirely reasonable that every attempt should be made to save the ruptured kidney, if there seem to be fair grounds for thinking that its vitality is not threatened beyond reasonable hope, or that enough secreting tissue is likely to survive the injury to make preservation of the organ worth the while. Should a portion only of the kidney be badly mutilated, or even detached, it need not necessarily cause sacrifice of the whole of the organ. Partial is preferable to complete removal.

For the control of hemorrhage the firm packing of gauze, either plain sterile or iodoform gauze, into or against the wounds, whether of the substance of the kidney or of its pelvis, is entirely reliable, and, more than that, it can be quickly done, which is a point of value, and in addition it serves well for drainage. Loops of gauze passed beneath each pole of the kidney before it is replaced serve not only to hold it in position, but afford firm support to the packs which can be introduced through the lumbar wound between the ends of the hammock strips. For the drainage of any dead spaces that may remain outside of the packed area, rubber tubes should be inserted.

Another and, when applicable, perhaps a neater way of controlling hemorrhage is approximation of the renal wound or wounds by means of mattress sutures of chromicized catgut. This measure does not seem to have met with general favor, however, or else the number of cases in which it could be employed is small, for Watson mentions but 8 instances, and I have found only 2 more in the cases since recorded, making in all 10 cases among 125 treated by conservative operation. Mathieson reports a case in which there were two large wounds transversely from the hilum, one of them almost bisecting the kidney. Catgut sutures controlled the bleeding effectually, and in three weeks recovery was complete. In a case reported by Chaput a single tear of the kidney was sutured. This patient also recovered, but bleeding from the wound continued for three weeks, and healing was not complete until three months had relapsed.

Cheyne and Burghard[22] speak of suture of the kidney as "much superior" to plugging, "and should be adopted whenever possible." It is suitable, however, in my judgment, only when the renal injury consists of one or more clean tears, and when the question of brevity of the operation does not have to be entertained; but when the wounds are lacerated and multiple, or when haste in operating is imperative, it is not available. If employed, drainage should be secured by a rubber tube.

Every recorded case in which the kidney wounds were sutured recovered, and in all but one of them the time of recovery was decidedly shorter than in the cases treated by gauze packing. But while recovery from operation was prompt in all but 1 of the cases (Chaput's) the ultimte result in 2, 1 recorded by Delbet and 1 by Watson, was not satisfactory. Secondary nephrectomy became necessary in Delbet's case, and was fatal; and in Watson's case a pseudohydronephrosis with fistula resulted.

In only 1 of the 5 cases which I have had could suturing have been done. In Case II, in which death from secondary hemorrhage took place, it may be that a different result would have been obtained if the single, clean, transverse tear had been closed by stitches. Should I meet with a similar case, and circumstances permit, I should suture the rent.

In spite of the advantage apparently offered by suturing, however, especially the shortening of the period of recovery, the number of cases to which it is adaptable must be small, and gauze packing satisfactory both for hemostasis and drainage, must be relied upon in a larger number.

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[22] Manual of Surgical Treatment, 1903, Part vi, Section II, Chap. xix, 191.

It must be admitted that there are some disadvantages attending the latter method, chief among which are the length of time required for healing of the wound and the possible development of a fistula. Then there is the possibility of secondary hemorrhage, which has occurred in a few cases, and the chance, a small one, should infection of the damaged kidney or of the perirenal space occur, of its being conveyed by way of the bladder to the opposite kidney.

It is quite true that the time required for healing is much longer than it is when nephrectomy is done, and this is unavoidable. As to urinary fistula, it has in the recorded cases been persistent in but a very small number, and in my patients who recovered it healed without difficulty. Should it, however, resist all ordinary measures to induce healing, nephrectomy may ultimately be required. Secondary hemorrhage has occurred in but a very few of the cases treated conservatively, and can usually be controlled by packing, as in the first place, and a further attempt made to save the kidney. The conveyance of infection to the opposite kidney is, if proper attention be given to the bladder, practically a remote contingency, and should not be given undue weight.

The final question is whether the disadvantages of conservative treatment of the injured kidney are of greater amount to the patient than the loss of the organ would be, and whether the slight risks are not fully compensated for by the preservation of an organ of such vital importance.

A word as to the care of the bladder. It is of the utmost importance that it should be freed of blood and clots either by washing with boric acid solution or normal saline solution, which will usually suffice, or by the evacuator tube, if so filled with clot that washing is not effectual, or, if that means fails, by suprapubic cystotomy, which may also be required should a tight urethral stricture prevent the use of a catheter. For some days after injury irrigation of the bladder should be done, and, in addition, as a further safe-guard against infection of the bladder, urinary antiseptics may advantageously be given by the mouth.

ASPIRATION DRAINAGE IN THE TREATMENT OF EMPYEMA.[1]

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The length of time in healing and the persisting sinuses in many cases of empyema, particularly in those in which pus has been retained in the pleural sac for some time before operation, suggests that the methods of ordinary drainage are inadequate in many cases.

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[1] Read before the Surgical Section of the New York Academy of Medicine, October 4, 1907.

Either because of the hindrance to expansion of a lung thickly coated with inflammatory exudate, and perhaps itself still affected, because of the unequal expansion of the lung, or because of insufficiently prolonged and effective drainage, each year a certain number of patients with persisting and discharging sinuses and contracted and misshapen chests present themselves in every hospital and clinic.

As the majority of patients get well through simple drainage, we have, I think, regarded the method of thoracotomy, with or without rib resection, and ordinary drainage as sufficiently successful, and have disregarded the smaller number of patients that drag on for months or years, and perhaps later, with shrunken chests and worse complications, are obliged to have one of the radical procedures to obliterate the pus producing cavity or tract.

Having been interested in the subject of drainage in these cases, I have in the past tried a number of schemes to facilitate it, but without any great success until the present year with aspiration drainage. Since a perusal of Dr. Bryant's article upon "Aspiration Drainage in a Case of Traumatic Empyema," in *Jacobi's Festschrift*, I have this year tried the method in all cases of empyema and of persistent sinuses of the pleura with so much success that I think the method worthy of further record and more general adoption.

A brief review of the history of surgical drainage in empyema, I think, is of interest, more than this being unnecessary in view of the works of Bouveret in 1888, Cestan's in 1898, and Bryant's article of 1906. While thoracotomy dates from the time of Hippocrates, it was not until after 1600 that even the trochar and cannula came into use. Surgical drainage appears to have been introduced by Chassaignac about 1859. Potain, in 1869, seems to be the first to have applied the siphon tube to evacuate the cavities in empyema. The evacuation was made through a trochar and cannula opening. Playfair in England, in 1872, introduced a siphon drainage by means of a long tube resting in a vessel of water, later arranged to permit of ambulatory treatment. This was one of the first continuous drainage appliances. Bülau, in 1876, introduced a similar method, an "aspiration procedure," and that for the first time was said to cure by lowering intrapleural pressure. Tachard, in 1874, and Revilliod, in 1880, again and apparently independently reported the use of permanent siphonage after pleurotomy. From the latter year the method became more popular on the continent, but was never generally adopted. From 1884 to 1889 Storch used the Bunsen aspirator, pus being drawn through a tube into an intermediary partly exhausted bottle.

Much complicated apparatus was evolved from this by followers in the succeeding years. In 1890, Phelps and Gilman Thompson, after animal experiments in the Loomis Laboratory, advocated valvular drainage after thoracotomy by valve flaps over the end of drainage tubes or a special apparatus containing such valves. O'Dwyer about the same time recommended this procedure after demonstrating by animal experiments the truth of the statement made by A. H. Smith in 1869, and by Frentzel in 1876, that the "compressed lung by fits of coughing and other expiratory efforts, with a more or less closed glottis, fills itself with air from the sound lung." If, therefore, intrapleural pressure can be removed, the lung rapidly expands. Northrup and Chapin in the same year advocated the procedure in children. Williams, of Liverpool, as early as 1878, and Menzies Hutton, of London, in 1893, independently made such an apparatus. In 1898 Perthes introduced *direct* aspiration by means of Bunsen's hydraulic pump with a manometer attachment showing the degree of negative pressure. He advocates the procedure for the radical cure of empyema.

It will be noticed that these procedures, with the exception of valvular drainage (which does not admit of perfect drainage), are scarcely ambulatory methods, and confine the patient either to the ward or his bed. The use of a collapsible, resilient rubber bag, the Politzer bag, which appears to have been first used by Bryant, is all that is necessary to make the treatment a distinctly simple and ambulatory one, permitting the patient to be up and out of doors as soon as he is able to leave his bed and with the continuous benefit of aspiration drainage.

A study of the healing cavity in the chest in empyema shows that it is closed in much more rapidly from side to side by lung expansion than from above downward, and it is in this factor that the danger of pocketing and retention by unequal expansion lies. In delayed sinus healing unequal lung expansion and the more rapid progress of the skin and fascial planes may so shut off the tract as to interfere with proper drainage. With a lung that has been compressed for a long time by purulent exudate the adhesions are so dense and the exudate so thick that some of them never expand again under simple drainage. Such a lung needs, in addition to pressure from within, not only the removal of pressure from without, but the establishment of a *decided negative pressure.* There are certain patients operated early, but in whom, nevertheless, even with good simple drainage, a sinus of considerable length persists. While I believe the method of aspiration drainage of greater value in the older cases of empyema and in the persisting cavities and sinuses, it has in the simple cases answered so well that I have used it as a routine procedure in all cases. The length of time that a lung may be compressed and still again expand is well shown in Case VI of the series, in which, after three years of pus in the chest with an imperfectly drained large cavity communicating with a bronchus, the lung was made to re-expand and fill its side of the thorax.

The amount of negative pressure required to overcome spastic contraction of the lung itself is slight, and has been variously estimated by Wintrich and Donders to be from one-eightieth to one one-hundredth part of an atmosphere. A lung coated with exudate and adherent may stand a higher degree of vacuum, but the constant effect of even so small an amount as that above mentioned seems sufficient in time. Too strong an aspiration at the start causes a sense of thoracic constriction and cough, and may tinge the exudation with blood.

It has seemed to me, in watching these cases, that in addition to the direct effect of expansion upon the lung there is a certain amount of Bier's passive hyperemia. Certainly dirty exudate is more rapidly thrown off and granulations stimulated and purulent exudate changed to seropurulent and serous than by any method I have ever seen.

The method of procedure that has seemed to me the best is to wait for several days after operation, usually done with resection of three-fourths of an inch or an inch of rib, to allow the escape of the major part of the purulent material; then to substitute a single tube of 35 to 40 French caliber, inserting it two and one-half inches to three within the pleura and packing about it iodoform gauze or absorbent cotton saturated with boric acid ointment. A piece of dentist's rubber dam four inches square with a small hole cut in it is stretched over the tube and run down to the side of the chest. This is overlapped by strips of two-inch adhesive plaster. (Figs. 1 to 4). A circular wad of absorbent cotton is placed about the tube and a chest binder put on with the tube coming through. A glass connecting piece and smaller tubing connects the Politzer bag. (Figs. 5 and 6). A number of devices of various materials have been made to secure an air-tight joint at the chest, but the above has been found simple, inexpensive, and more easily adapted to thin and angular chests, and I have seen it last for more than two weeks without leakage. Patients soon become outdoor cases and the bags are easily held under the clothing, and can be emptied as required by the patient and replaced. We endeavor to change the dressing every week and note the lung expansion and vertical depth of the cavity or sinus. When the lung has expanded and comes in contact with the tube all about, which it frequently does in an astonishingly short time (we have seen it in a week after application of the aspiration), the tube is shortened, provided the vertical depth is shortening or is very narrow. In this way the tube is gradually removed as the cavity is obliterated.

It has been supposed that fibrin coagula would occlude the tube and prevent drainage, but practically this has very seldom occurred, and is easily remedied by probing up the tube or its removal, when the clot comes away sticking in the end of the tube. I have seen fibrin strings well down the drainage tube without interfering with the flow of pus.

I have used this method of aspiration drainage in eight cases at St. Luke's and Trinity Hospitals. Upon the ward patients at the former I have had the privilege of operating through the courtesy of Dr. Abbe, in whose service they occurred.

Case I.—Private patient; man aged forty-two years. Empyema of the right chest, following pneumonia six weeks before entrance. Patient much emaciated and had retained an immense purulent collection in the chest certainly for three weeks, if not longer. Operation January 23, 1907: Portion of the eighth rib below the angle of the scapula resected under local anesthesia. Lung greatly compressed and shrunken and adhesions dense. Four days later the Politzer bag was connected to a single drainage tube, and the patient was allowed up in a chair for a short time. A week later the dressing was changed and the cavity in the chest found but little more than half the size it was at operation. Two weeks later the cavity measured 6½ by about 2 by 1½ inches by uterine sound. On discharge, February 20, 1907, just four weeks after operation, a sinus four and one-half inches long and the size of the drainage tube (30 French) remained. On March 16 the wound had healed and the patient had gained more than twenty-five pounds in weight. In forty-seven days after the institution of aspiration drainage the wound was healed.

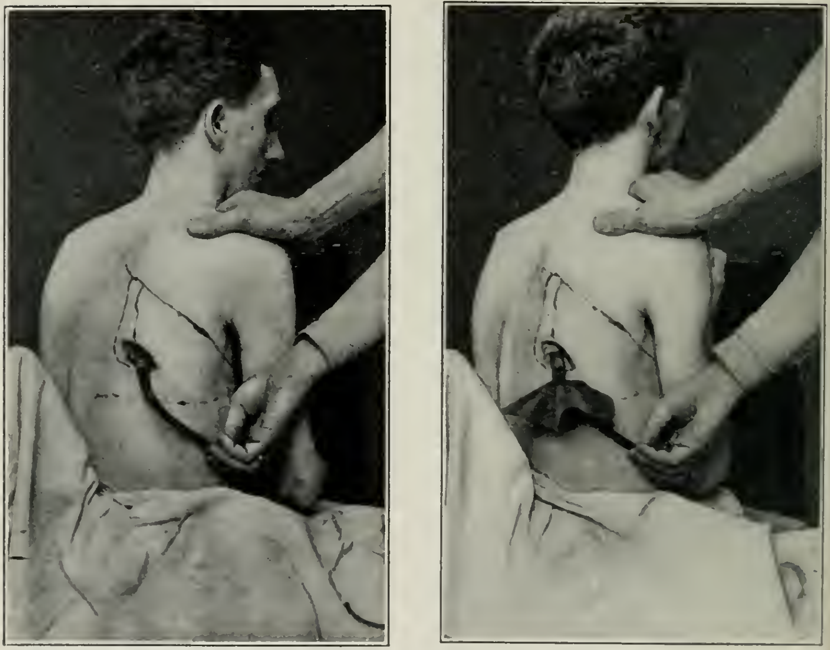

Fig. 1 Fig. 2

Figs. 1 and 2.—Successive steps in the application of the aspiration drainage, and the means of obtaining an air-tight joint at the wound.

Case II.—Man, aged thirty years. Empyema of the right chest following pneumonia. Transferred from Medical Division and operated on February 4, 1907. Resection of portion of the seventh rib in posterior axillary line; empyema cavity of average size. February 11, one week after operation, but slight expansion of the lung was noted and the Politzer bag was connected. Three days later there was a very appreciable lung expansion and increased discharge. On February 19, the ninth day of the bag drainage, the cavity had contracted to a size scarcely larger than the drainage tube and the walls were clean and granulating, drainage thin and seropurulent. On March 2, the eighteenth day after the application of the Politzer bag, the patient was discharged with a small healing probe sinus about one and one-half inches deep, requiring small external dressings only. Aspiration drainage was used but nine days in this case, which was a simple empyema with early operation.

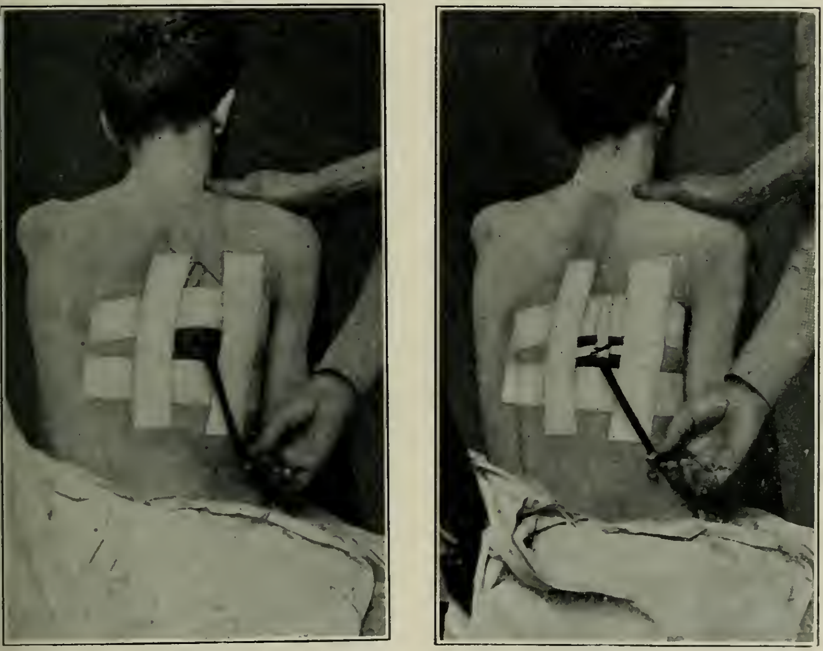

Fig. 3 Fig. 4

Figs. 3 and 4.—Successive steps in the application of the aspiration drainage, and the means of obtaining an air-tight joint at the wound.

Case III.—Boy aged nineteen years. Empyema of the left chest following pneumonia. Transferred from the Medical Division and operated on, April 8, 1907. Resection of the seventh rib in the post-axillary line; cavity of considerable size; heart displaced to right. April 14, aspiration drainage. April 25, it was found the cavity measured four and one-half inches vertically and the lung had contracted down about the drainage tube. The aspiration was discontinued and Bier's cupping tried twice a day, but this, I believe, was a mistake, as the wound closed too rapidly and the lung nearest the wound expanded, and partial pocketing was the result. The aspiration was again put on for about a week. On May 7 the sinus measured three and one-half inches and was of small probe size, and he was discharged with external dressings only. He had a small reaccumulation shortly after discharge, but upon evacuation the wound closed completely. Time, I think, was lost in this case by too early removal of aspiration and by the technical mistake of cupping instead of aspiration drainage through a tube, which prevents the lung expanding and closing off the sinus before the distal portions are healed.

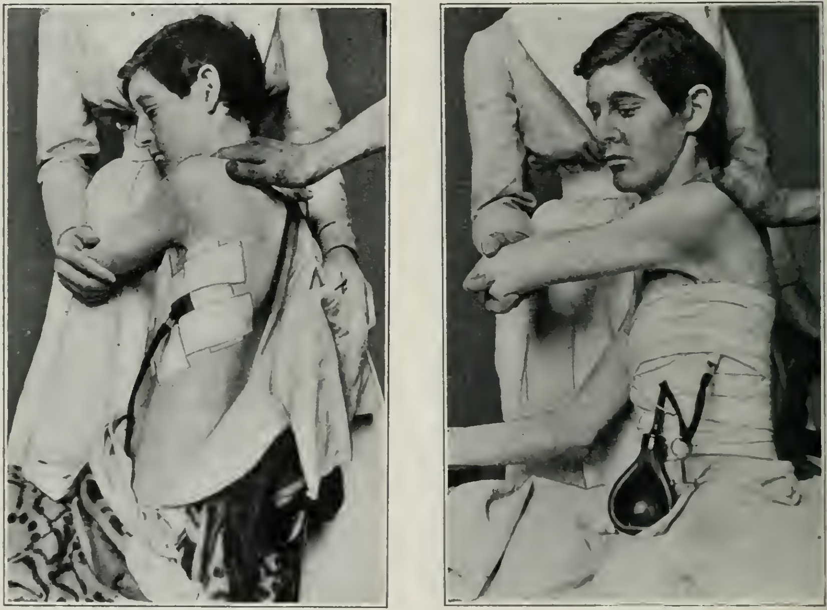

Fig. 5 Fig. 6

Figs. 5 and 6.—Final application of the binder in the dressing.

Case IV.—Man, aged twenty-eight years. Empyema of the right chest following pneumonia four weeks before admission. Operation May 15, 1907; cavity of moderate size. May 17, Politzer bag put on. Five days later (May 22) the chest cavity had contracted to a space three and one-half inches vertically by about an inch laterally. May 31, the chest cavity measured two and one-quarter inches in depth by one-half inch, and the further expansion of the lung was prevented by the drainage tube. Being mindful of the last case, a tube of 30 French caliber was reinserted one-and one-half inches and aspiration instead of cupping continued. On June 7, twenty-three days after operation and twenty-one days after the beginning of aspiration drainage, the patient was discharged with a shallow small probe sinus, which was healed June 10.

Case V.—Boy, aged six years. Empyema of considerable size of the right chest, probably following pneumonia. Admitted and operated on June 19, 1907. Incision between the seventh and eighth ribs below and internal to the angle of scapula. On the third day Politzer bag attached, dressing forceps pass five and one-half inches upward and back. It was very difficult to keep proper aspiration going in this case of a restless child, and the drainage apparatus more often acted as a plug than as an aspirator, so that it was eighteen days, on July 8, before the lung had expanded to the drainage tube, and the depth of the sinus was four inches. Two weeks more of interrupted drainage reduced the sinus to a narrow channel three inches long. I am undecided in this case whether it was not one of those examples of slowly healing sinuses that tend to remain open indefinitely because closing so slowly from above, lung expansion along the tract and skin closure pro-

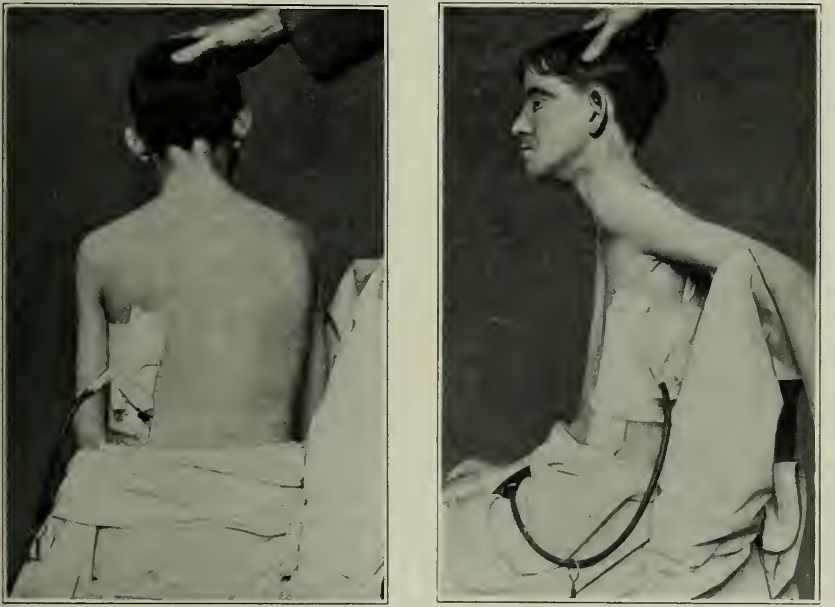

Fig. 7

Fig. 8

Figs 7 and 8.—Case VI, several weeks before discharge from the hospital. The dressing had been in place ten days. Drainage tube surrounded and built up with adhesive plaster.

ducing pocketing. For want of ward beds he was sent to the Out-Door Department with simple drainage, and was only healed a month later. I believe the time in healing would have been materially lessened had we been able to maintain efficient aspiration drainage.

Case VI.—Boy, aged fifteen years. Three years before entrance had an acute empyema following pneumonia. He was operated upon at home by an intermuscular incision by his own doctor. A year later, because of a persisting sinus, he had a portion of rib resected and further drainage. On entrance he was emaciated and the left chest was flat and contracted and measured two and one-half inches smaller than the right. There was a small discharging sinus at the ninth rib anterior to the axillary line. A uterine sound could be introduced for five and one-half inches up and in and swept about, revealing a cavity of some size with dense walls. Rotating the sound inward the heart beat could be markedly felt. The apex beat was displaced to the edge of the sternum in the fifth interspace. There was a foul, copious, purulent expectoration of the same character as the discharge from the sinus, but containing no tubercle bacilli. Methylene blue solution injected into the sinus was expectorated. On June 5 the sinus opening was enlarged, eight ounces of pus evacuated, and the outgrowth of bone from the periosteum and rib removed to establish free drainage, and in the hope that the communication with the bronchus would close. Expectoration ceased five days later, and after ten days a soft Politzer bag with slight aspiratory force was put on and found to remain collapsed. The boy gained rapidly in strength and weight, and was soon able to leave his bed and be out of doors. Four weeks after the beginning of the aspiration he had gained twelve pounds, and the difference in the chest measurements (at the third interspace) was but one and one-half inches. A week later his cavity had narrowed to a sinus running upward and in, but four inches deep from the skin and admitting a 15 French catheter tube. (Figs. 7 and 8). Aspiration was discontinued and a simple shorter tube inserted. He was healed August 12, two months after the application of the Politzer bag, and had gained at this date twenty-four pounds in weight. The total duration of aspiration drainage was five weeks. He was made to take breathing exercises, stand erect, and to blow against resistance, all of which I believe materially aided the lung to expand, coupled with the negative pressure in the chest, later somewhat raised by a stiffer bag.

Two more patients were treated by aspiration drainage, but the case-histories cannot be reported in full, since one patient left the hospital after considerable progress in healing a sinus persisting after a former operation, and in the other aspiration was discontinued because of a severe coincident vulvovaginitis and isolation.

The simple cases of empyema operated upon early recovered speedily. Those of longer duration before operation recovered more slowly, but still much faster and, I am convinced, more surely than with simple drainage. The value of the method is, I think, best shown in Cases I and VI. In tuberculous empyema with pulmonary involvement, or with pneumothorax, the method is scarcely applicable. Its routine employment in cases of empyema will make such procedures as Estlander's, Schede's, and Delorme's, I am sure, exceedingly rare.

THE RÖNTGEN-RAY TREATMENT OF HYPERTROPHIED PROSTATE.

By James W. Hunter, Jr., M.A., M.D.,
OF NORFOLK, VIRGINIA.

The complete failure of medical treatment to afford any permanent relief in cases of hypertrophied prostate, as well as old age and an enfeebled constitution, makes this class of patients one of the most annoying that the practitioner is called upon to treat. Nor has surgical intervention been the precious boon that it apparently promised. The high mortality immediately attending the radical removal of the prostate, and the grave danger of infection following this and the Bottini operation, have naturally suggested some indirect measure. Thus, upon the assumption that a double oöphorectomy causes a marked reduction in the size of a fibroid uterus, the mutilating operation of castration has come largely into favor, and more recently that of vasectomy. Yet the object sought has not always been accomplished. In most cases, therefore, under the old methods of treatment, the best that could be done was to teach the patient the correct use of the catheter.

The atrophying action of the Röntgen-rays upon glandular tissues naturally suggests its application to the prostate; its especially selective action upon the genitalia would seem to confirm our suspicions. Thus Gautier,[1] of Paris, addressing the Congress of Sciences held at Montarban on August 7, 1902, says that in his experience nothing compares with the Röntgen-ray treatment of hypertrophied prostate. He used 2 ampères at 110 volts, directing the rays upon the perineum and lower abdomen, and thus secured a double benefit, that is, a diminution of the residual urine and a relief from the suffering, decided results being obtained in from four to eight sittings.

Carabelli and Luraschi,[2] however, were the first definitely to announce their experience with the new treatment. After waiting a year they reported, in August, 1905, 2 cases completely cured. In 1, a man aged sixty-years, the rays were applied some fifteen times, at first two or three times a week, then once a fortnight. The sensory symptoms entirely vanished, and urination became easier. The other patient was sixty-five years old. Here the prostate was greatly enlarged and hard, there being about 200 c.c. of residual urine and evidences of a chronic cystitis. After six sittings the residual urine was reduced to 40 c.c.; the urine itself was clearer, and urination easier. After 10 irradiations there remained but 10 c.c. of residual urine. The patient was dismissed as entirely cured.

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[1] Brazil Medico, Rio de Janiero, 1902, xvi, 403.

[2] Gazetta degli Ospedali Milano, abstracted in Jour. Amer. Med. Assoc., September 2, 1905.

On the other hand, Moszkowicz[3] reports 3 cases, aged respectively sixty-one, sixty-six, and seventy-seven years, all of whom had to lead a catheter life. On the day following the first sitting, the patient could urinate without the use of the catheter; a week later the prostate was softer and continued to decrease in size. But in the first case, seventeen days after the last irradiation, there was an epididymitis; in the second, fourteen days after, the symptoms of a hemorrhagic cystitis. Consequently the third case was treated only once. Naturally we must suspect some reason for these complications. Personally, I believe that the technique was at fault, and I shall discuss this later.

Tausard and Fleig[4] treated 2 cases. The first was that of a man aged sixty-three years, who had twice had an attack of gonorrhœa, at seventeen and twenty-seven years, respectively, each attack lasting about two years. At thirty-two he experienced a double orchitis. When first seen he presented the symptoms of prostatic hypertrophy, a rectal examination showing a tumor the size of a hen's egg. He was treated some nine months, receiving 13 irradiations, and was dismissed as cured. There was only one urination at night instead of five or six, while the residual urine was reduced from 50 c.c. to none. An exceedingly slight prostatic enlargement remained at the time of dismissal; the cure has been permanent. The second patient, though irradiated only four times, showed a marked improvement. A malignant growth of the intestinal tract, however, prevented further treatment.

Schlagintweit,[2] though not reporting any particular cases, states that he has irradiated 53 cases of hypertrophied prostate, of which 30 received more than three sittings. All of these 30 were greatly improved, although in his experience the residual urine did not decrease in proportion to the other improvements. In uncomplicated cases he considers the Röntgen-ray treatment superior to all other methods.

To these, I would add one case of my own:

[3] Münch. med. Woch., 1905, lii, 730.

[4] Annales des maladies des organes génito-urinaries, 1902, xxiv, 1841.

[5] Ztschr. f. Urologie, Band i, Nr. 1, 51–53.

Mr. G. Carpenter, aged eighty years, a widower. Suffered with a hyperacidity of the stomach and chronic cystitis of eight years duration, the urine showing a large amount of pus, but no involvement of the kidney. Other history negative. In December, 1906, he exerted himself too severely while placing a post, and as a result had a severe orchitis. This yielded to treatment, but on February 2, 1907, there was a beginning of prostatic symptoms, among others frequency of urination (arising as many as six times a night), with pain and burning about two inches from the end of the penis. In spite of treatment, however, the patient gradually grew worse until April 15, when he was able to void only about a half ounce of urine at a time. There was also a marked phosphaturia and about 60 c.c. of residual urine.

About this time I decided to try the Röntgen-rays as a last resort, operative intervention being manifestly out of the question.

May 2, first exposure, twenty-five minutes.

May 8, second exposure, twenty-five minutes.

May 27, third exposure, fifteen minutes.

Internal medication was then stopped, and the patient enjoyed complete comfort until June 27, when the entire train of symptoms returned much aggravated. He went to bed. On account of the patient's condition, and his inability to make frequent visits to my office, it was decided to push the Röntgen-ray treatment as rapidly as possible.

July 6, fourth exposure, forty minutes. Some relief, but a slight toxemia, occurring as a delirium.

July 16, fifth exposure, thirty minutes. Continued improvement, though a slight delirium still occurs. Retains urine as long as two hours at a time.

July 23, sixth exposure, twenty minutes. Improvement continues. Voids urine with very little trouble.

July 31, seventh exposure, twenty minutes. Retains urine as long as normal; only arises once or twice at night. Feels as well as he ever did. No pain at urination, and passes large stream. A marked reduction in the size of the testicles.

August 12, eighth exposure, twenty minutes. Except for a large amount of urination in the early morning, the patient feels as well as he ever did. Arises only once during the night. Rectal examination discloses a prostate somewhat larger than an egg.

August 25, ninth exposure, fifteen minutes. Patient is symptomatically well. No untoward symptoms. Rectal examination reveals a prostate only moderately enlarged. A marked atrophy of the testicles. Urine is clear and unscented. The residual urine has been reduced to 15 c.c.

While this is, of course, only a preliminary report, the amelioration of the symptoms has been so rapid that I have no doubt of a permanent result, though I shall continue the Röntgen-ray treatment for a season longer. Thus far, there has been no unpleasant results from the rays, in spite of the long sittings; only a slight bronzing of the skin. I attribute this to the fact that a very old and well-seasoned tube was employed.

My own technique, though developed independently from that of the other operators, follows in the main that of Carabelli and Luraschi, with the exception that I use a current of 2 ampères at 110 volts instead of 1.5 ampères at 100 volts, and place my patient in a lateral or Simms position rather than on an inclined plane. The parts surrounding the perineum are protected by lead foil, though Tausard and Fleig prefer a specially constructed diaphragm. Gautier irradiates the lower abdomen also; both Moszkowicz and Schlagintweit employ a short, wide speculum, thus irradiating the prostate through the mucuous membrane of the rectum. We all prefer moderately high tubes so that the whole gland may be treated; Tausard and Fleig specify a No. 7 on the Benodist radio-chromometer, Schlagintweit a No. 7 on the Wehnelt scale. I employ an eighteen inch coil with mercury interrupter, two layers of the primary being connected in series. In very old men I would also expose the scrotum, as the good effect sometimes attending a castration can be added to that of the direct exposures, and thus hasten the cure.

It must be remembered that the mucous membrane, wherever situated, offers but a slight resistance to the Röntgen rays, and is, therefore, far more susceptible to an inflammatory condition than the skin. It is this very failure to resist malignant neoplasms that has made the Röntgen treatment of so little avail in the treatment of uterine and buccal carcinoma.[6] Hence the procedure of irradiating the prostate through a rectal speculum, as practised by Moszkowicz and Schlagintweit, is strongly to be condemned. It entirely explains the former's apparent failures. Moreover, as the lower bowel is very absorptive, the constant passage of fecal matter over an inflamed surface is attended with more or less danger of spreading an infection. Thus, in Moszkowicz's cases, it is not the Röntgen-ray treatment that was at fault, but his own technique.

It is entirely too soon to lay down any hard and fast rules as to what class of patients shall and what shall not be irradiated. Time alone can relegate the rays to their proper position. Personally, I feel (and all of the operators seem to agree with me) that better results can be obtained in hypertrophy of the first and second degrees than in cases in which there has been much sclerosis. I should not, however, decline any case. We have a new and effective treatment. It bids fair to surpass all others in the brilliancy of its results, and to cure all but the oldest and hardest prostates, which must, of course, be removed surgically.

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[6] See the author's article in the Amer Jour. Med. Sci., March, 1906.

THE TREATMENT OF PSYCHASTHENIA FROM THE STANDPOINT OF THE SOCIAL CONSCIOUSNESS.[1]

By James Jackson Putnam, M.D.,

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The treatment of the various psychoneuroses is often attended with great difficulty and, even when we feel that we have aided to bring about results of real value, we frequently have a sense that more might have been accomplished. We are amply provided with means for acting on the bodily nutrition and for securing certain sorts of mental influences. It cannot, however, be said that our therapeutics thoroughly reflects all that we even now know of the complex organization of the human consciousness, its capacity for effective coöperation, and the dangers by which it is threatened.

One of the most striking facts with regard to the conscious life of any human being is that it is interwoven with the lives of others. It is in each man's social relations that his own mental history is mainly written, and it is in his social relations likewise that the causes of the disorders that threaten his happiness and his effectiveness and the means for securing his recovery are to be mainly sought. This principle is well established, but its bearings are not sufficiently recognized, and the purpose of this communication is to emphasize certain aspects of the subject which have seemed to me important.

The more closely we scrutinize our social bonds, the more widespread and deeply rooted they appear.[2] We cannot enumerate these bonds, but we must believe that every one of them, amalgamating itself with all the rest and thus modifying itself and them, helps to organize that vast system of interacting forces which constitutes our social consciousness. The child escapes from the necessity of protection by the parent only to associate himself with his comrades and then to become the centre of a new community. We toil for others and measure our successes and failures by their opinions and approval, or by a personal judgment which gets its color from a half-felt judgment of our neighbors. Our fears are intensified by a sense of what a mishap to us would mean to other men, or how our failure would cause us to appear in their eyes. Many habits and customs that seem to be independent of social influences at their origin become strongly modified by them as time goes on. We take our food ostensibly to satisfy physiological needs, but were it not for social considerations we should perhaps still be bolting our meals like dogs. The great instinct of confidence (of which credit in business is one form) that furnishes us with a species of short cut of marvellous usefulness, like the calculus in mathematics, is claimed by Claparède[3] to be of biological origin, an acquisition through fortunate but accidental variation occurring in the course of evolution; but, be this as it may, it is as a social force that it gains its chief importance. The sense of terror and helplessness that attends even a hint that loss of confidence is impending is the strongest warrant for its value.

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[1] This essay represents an expanded portion of a paper read in abstract at the meeting of the Association of American Physicians, Washington, D. C., May 7, 8, and 9, 1907. Several other topics which were touched upon in the same paper will be taken up in subsequent communications.

[2] Many of these relationships and their modifications in disease have been admirably discussed by Professor Josiah Royce. See especially Certain Anomalies of Self-consciousness, in his Studies in Good and Evil.

The closeness of the bonds that link together the members of a community, looked upon as separate units, is illustrated and reflected in the mental constitution of every individual. The inspiring preacher and his audience, the impressive doctor and his patient, the husband and the wife, the parent and the child, each member of a pair of friends, stand toward each other in relationships not only as of subject and object (of affection, etc.), or of two beams converging on a common focus, but of still closer and more subtle sorts.

What is an individual?[4] Is he limited by his skin? Is he constituted by some assumed "sensorium" occupied by his consciousness alone? Is he only as large as his brain and nerves? Or, on the other hand, is he coextensive with the scope of his conscious interests and affections, and thus to be considered as complete *in himself* only when his relations to others are taken into account?

The latter is obviously the only tenable view. Our bodies are not more "ourselves" than the clothes we wear, the cane with which we strike off the heads of the flowers on the roadside, the rooms in which we live, except just in so far as they are more habitually the objects of our (subconscious) perceptions and our thoughts. No one is especially anxious to claim personal significance for the hair and nails which he cuts off and throws away as belonging rather to the physical world outside than to himself.

As it is with our bodies, so is it with our thoughts. There is no possible means of describing consciousness, the mental life, but in terms partly of its contents and partly of the conditions under which it habitually works. Just as the actual presence of a friend, his facial expressions, the signs of his emotions, may become such essential parts of a man's environment that in other surroundings he is a different person, so his imagined or remembered presence acts. A thought struck out by two minds acting in conjunction belongs afterward to both, just as the flight of a ball struck by a bat points back alike to thrower and to batter. This principle is of importance as emphasizing the intricacy of the relationship between the community and its members and as indicating the responsibility which attaches to relationships allowed consciously to grow up between each man and his habitual associates. It is not a matter of indifference whether the physician represents, in relation to his patient, a form of community consciousness or of world consciousness of the best or of a less good sort. The fanciful story of Trilby, able to command her voice and memory only when hypnotized by her temporary master, indicates in caricature the influence of every strong personality, present or remembered, even subconsciously remembered, and this influence may be of a favorable or an unfavorable kind.

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[3] Jour. Abnor. Psych., vol. i, No. 2, and elsewhere.

[4] See, especially, Nettleship, Letters and Essays.

The social consciousness of a child is formed largely by imitation, imitation of others and of himself. With the acquisition of language, however, and the consequently increased capacity for comparison of mental conceptions which make possible the rise of self-consciousness, the social consciousness takes on a wholly new development. The term self-consciousness suggests but imperfectly the change which the mental life at this period undergoes. To become self-conscious signifies indeed to become aware of the meaning of one's own acts and one's own thoughts, to recognize one's self as a moral agent, to eat of the tree of the knowledge of good and evil, to leave the garden of Eden for a land of greater possibility of conscious development. But this means also learning to look upon one's self through the eyes of many others, and, as an inevitable accompaniment and corollary of this great change, becoming in a truer and more conscious sense a social being. Thenceforward one cannot live, enjoy, or suffer alone, but must share one's lot with one's fellows, bear their burdens, rejoice with their successes, and learn to endure their actual and assumed reproaches.

With the coming of self-consciousness there come also the mental disorders of social origin, due primarily to a failure to grasp the full meaning of one's social environment, its dangers, and its possibilities, and then to the adoption of morbid sentiments, habits, and traditions based on these misconceptions. The "self-conscious" person, in a morbid sense,[5] is one who has a vague sense of himself as a person surrounded by an imagined circle of critics, enemies, or admirers, toward whom he must adopt an attitude of secrecy, shame, hostility, or superiority. His diverse mental states may even become personified in his own eyes so as to reproduce the community in miniature. He then sets himself against himself, and following a natural but morbid social instinct he lends himself to the development of an inward drama in which his varying moods, like well-trained actors, play sharply defined parts, one of which is likely to be that of the villain of the stage.[6] Thus occur certain diseases due to mental dissociation in the self-conscious sphere. So, too, the depressed person intensifies his own sufferings by playing for an imaginary audience the rôle of one whose causes for suffering are greater than his own. The cure consists in showing up the real nature of the imaginary drama, proving it to be as much a comedy as a tragedy, and substituting for it the drama of real life, with its aims and incidents and motives interpreted afresh with the aid of a broader vision.

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[5] Royce, loc. cit.

[6] See Edward S. Martin's well-known lines [Sly Ballads in Harvard China].

> "Within my earthly temple there's a crowd;
> There's one of us that's humble, one that's proud;
> There's one that's broken-hearted at his sins,
> And one that unrepentant sits and grins;
> There's one that loves his neighbor as himself
> And one that cares for naught but fame and pelf.
> From much corroding care should I be free
> If once I could determine which is me."

Of course much of this process, like much of the whole process of development of the social consciousness, takes place "subconsciously," but it is none the less the patient's own waking consciousness that in the end must stand the loss or gain, according as the result comes out. The significance of this subconscious reasoning has often seemed to me well illustrated by the results of the nervous shock which so often follows railway accidents of slight amount. One is forced to conclude that the word, the very thought "accident" often precipitates, in the form of an emotion of intense fear, a mass of vague memories and traditions of which the patient could have given consciously no account, and many of the elements of this fear point to misconceived social relationships. The victim exaggerates, in his panic, his isolation in misfortune, his need of pity and of consideration, and the criminality of those to whose negligence he attributes his mishap, while at the same time his own sufferings are intensified by the sight of the sufferings of his companions in distress or through the thought of the immunity of those who had escaped.

I have indicated roughly the passage of the relatively simple consciousness of the young child into the completer self-consciousness of the adult,[7] and have hinted at the mode of origin of some of the disorders which follow in the train of this great change, of this acquisition of that marvellous power of insight into the lives of other men which so often leaves its possessor a confused and dazed spectator of his own life. To avoid this confusion means to become possessed of a well-balanced nervous organization, a unified system of mental functions, which has a greater or a less value according to the breadth of its foundations and the firmness of its structure. To fall into the confusion means to waver between a better type of consciousness and an inferior one, with the danger that the latter will often dominate the former, just as a baser currency drives out one of a nobler sort with which it is in competition.

Fortunately this cannot occur without the victim becoming dimly aware of what is going on, and aware, too, although perhaps but vaguely, of the better state which he sacrifices for the less good. The wilfully selfish or misanthropic person is in some degree alive to the value of the better social conditions which he affects to disregard. This same principle applies to the case of the psychasthenic patients. They estimate their sufferings in part by a more or less definitely recognized contrast with a more normal state which in reality they approve and for which they half-unconsciously long, and this fact is a warrant of hopefulness for their recovery, provided they are willing to be led toward a fuller realization of their ideals.

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[7] Animals and infants doubtless have rudiments of self-consciousness.

The sense of dependence upon others which makes a person self-conscious implies, from another point of view, an interest in others which only needs to be developed in order to be a source of happiness and strength instead of a source of mischief and disorder. It is impossible to draw a sharp line of division between the unfortunate characteristics which in some persons are gladly excused as the faults of their good qualities and the traits which stamp their possessors with the name of morbid. Thus, much is forgiven to the excesses of "individualism," even though it leads to a defiance of the just claims of others, and to a weakening of the sense of loyalty to common needs, because it is recognized as the mainspring of progress for the community as a whole. But individualism, when pushed to an extreme in another direction, readily develops into a silent or sullen sense of painful isolation, and this is called morbid, largely because it is useless.

It is justly felt that it falls within the province of education to cure people of these exaggerations of normal traits, but in fact they are often based upon deep-seated diseases of the brain which physician and patient alike struggle in vain to overcome, as Odin strove to drain the horn of wine which he found at last to be connected magically with the sea. Fortunately the reverse is also true, and I regard as of extreme importance the cases which are now and then reported to show that tenacious delusions of suspicion and persecution, such as commonly point to degeneracy and constitutional defect, may be in reality the product of narrow, barren, superstitious, savage conditions of social environment, which a broader civilization should be able to improve. Histories of this sort, for which the fierce and narrow individualism of New England country life has often furnished the materials, teach us to hesitate before making the diagnosis of fatally progressive "abiotrophic" tendencies, and encourage us to stronger therapeutic efforts.

In recalling to the memory the arguments which tend to show how dense is the web of common interests, affections, and needs which, though unseen, bind all our lives together almost as closely as the several moods of anyone of us are bound, and in indicating the significance of these relationships for the occurrence of diseases which often seem to caricature our very means of progress, I do not fail to recognize that these influences have their limits. There are other causes for disease besides the social causes and there are other avenues to recovery besides those which depend upon a strengthening and purifying of social ties. This is not urged as a substitute for any treatment, but as a supplement to all. I recognize also the gulf that lies between the logical presentation of the case to the suffering patient and the emotional state of confidence, of actual conviction, that means his cure. Nevertheless, I think it is a distinct lack of many of the established methods of treatment that they fail to deal sufficiently with the conscious motives as means for unlocking hope and energy, and although there are many motives by which men's minds are stirred that do not point to social relationships as their cause, still the social motives are stronger than any except the religious motives, and these draw a large portion of their nourishment from the social sentiments on which they largely lean. It is not only the claims of those that stand nearest in blood which are recognized as paramount. The demands of social loyalty are a free-mason's bond that calls out the best from college student, from soldier, from citizen, and may even inspire respect and admiration for the motives of those with whose opinions we most fundamentally disagree.[8] Is there no place for high-class loyalty such as this in the reciprocal relationships of the invalid and the community? Assuredly there is. Now and then we see, besides the stoical invalids and the self-forgetting invalids, the "high-class" invalids who realize that by virtue of their illness they are in a position to fill a certain place of definite significance among their fellows, and the enthusiasm with which they are greeted shows that their attitude is appreciated. Such invalids were Pascal and Stevenson and many more whom every physician could name. What are the arguments for this attitude? What are the obstacles to its more general adoption? What are the motives which are seen to animate and give energy and courage to those who seek to hold it? These are questions which have long been before my mind and for which I have sought an answer. They may be taken up together, as a physician might imagine himself taking them up if talking with a patient suffering from obsessions, depression, and morbid fears.

Every physician knows that before he can present logical arguments to such a patient with any expectation of securing his attention and effective coöperation he must do something which will mitigate the feeling of emotional distress, illogical and vague but irresistible, by which he is beset. The inhibitory effect of this burden once relieved a little, the arguments for a more rational attitude come in properly to carry the improvement farther. This emotional distress is multiform in character, but the most fundamental part of it is often an ill-defined yet grinding sense of social isolation which gets its primary impulse partly from without but mainly from within. The invalid is keen to note the real indifference of those around him and quick to magnify its meaning and to let it intensify the feeling that he stands alone. The thoughtless ostracism by children of playmates who are not acceptable to the leaders of the band may be the starting point of the same feeling, and proves the source of lifelong and growing misery with some persons, though fortunately it gives the first impulse toward the formation of a stronger character with others. Then the invalid's own physical weakness, his inability to conform to social standards, to compete in occupations, to take part in sports and games, sometimes raises a fence out of which his active imagination builds a wall. Again, believing that he is a sufferer from a unique disease, he feels that his neighbors look on him as a species of monstrosity, as something unlike themselves and therefore to be ostracized. The invalid who fancies that he notes this sentiment in others is only too ready to justify their attitude and to adopt it as his own, thus carrying out the idea that he himself is virtually a community, one part of which may stand over against the other part and pass unfavorable judgments on its acts. It is probable that now and then this vague but oppressive sense of self-blame is accentuated by the crude and foolish doctrine that disease always does arise from "sin," or from "infraction of nature's laws," as if it were not well established that in plant life, in animal life, in conscious life, antagonism, destruction, and loss may be the means to progress, even if not the best or only means. The suppression of lower sentiments for the sake of higher, which forms the basis of all forms of mental healing, is the analogue of the suppression of the noxious bacteria in the interests of man. Progress toward a more complex form of civilization is possible only through nervous "instability," and this instability opens the way at once to sickness and to higher planes of health. We human beings should seek to reach the higher planes with as little loss as possible, but should not shun the climb on account of the danger it entails. The conception of an ideal world may include the idea of health attained, a real equilibrium,[9] but our finite task is to minimize the losses of a battle from which we do not shrink. Lessing states the facts when he says: "Wenn Gott in seiner rechten die Wahrheit und in seiner linken den ewigen, immer regen Trieb nach der Wahrheit, jedoch mit dem Zusatz, sich immer und ewig zu irren, verschlossen hielte und sagte zu mir 'Wähle,' Ich fiele ihm mit Demuth in die linke und sagte, 'Vater gieb; die reine Wahrheit ist ja doch nur für Dich allein.' "

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[8] This point has been worked out with especial care by Josiah Royce.

Even when the sense of isolation is not felt explicitly and as such is not due in influences from without, it is often felt as an intangible cause of nameless dread. It forms a definite part of the deep sense of unreality and impairment of one's hold on the immediate present, on one's natural affections and natural responsibilities, that Janet notes as the essential feature of psychasthenia. It may be an outgrowth, too, as has already been remarked, of the sense of individualism, which if rightly understood is indispensable to sound development. It is difficult, or impossible, in tracing back these fundamental feelings, as of courage and fear, confidence and suspicion, to be sure that one can decide correctly under which long shadow the antisocial sentiment of isolation first arises. The important thing is that doctor and patient alike should recognize that it springs from various causes and may be relieved in many ways. Vicious circles get established which vary with the individual, and it matters little how they are broken into, provided it be done. With one person courage or confidence shown in the conduction of his own affairs may be the first step toward his elimination from the sense of isolation. With another some more definite manifestation of personal sympathy or explanation is required, especially from the physician acting as representative of the community. In other cases it is more stimulating, instead of offering sympathy, to make it clear that the community, through many of its members, stands ready to make common cause with the patient in helping him to solve the problem that confronts him, and ready to appreciate at its full value any contribution that he may make on the basis of his special experience toward the more general problem which the occurrence of sickness and pain is always urging. This is the true conception of the case. In the eye of biology, as of ethics, in the interests of progress, and under the demands of necessity, the members of a community if relatively many are also relatively one, and the conceptions implied by "loyalty" embrace claims and obligations of the most varied sorts. It is no criticism of this doctrine to show that it becomes ridiculous when the attempt is made to apply it exclusively and universally; it has force enough within legitimate limits. In a sense to be interpreted with discretion, but ever more generously and more reasonably, we are all members of a social "team," and the difficulties that beset the individual invalid are difficulties for us all. The invalid has just claims on the community, not only as a needy member, but because, if he plays his part aright, he may help to work out a problem that might at any moment become of personal importance to some other individual. The community has a reciprocal claim upon the invalid member, just as an army has a claim upon the individual soldier to whom an arduous task has been assigned. It is not a help to the invalid for those who count themselves as well to shrink and shudder at his fate or to offer him the sort of sympathy which this feeling prompts. It is a help to take him, as many invalids are ready to take themselves, as a person with a special destiny, a special part to play. I do not advocate the adoption of this attitude on the part of the community as a part of the theory that everything that is is right, or even that every evil leads necessarily to good, or that every misfortune is somehow compensated by good fortune. Of course, these opinions count, for those who hold them, as watchwords of immense power. I am here advocating, however, only a human working scheme which, if followed cordially and enthusiastically by sick and well alike, is likely to bring more benefits to more persons than any other scheme, even if not the wished-for benefit to each and every given person. "Sympathy" implies apartness and a gift; coöperation implies acceptance of the conditions of living, and of personal illness, if need be, as a part of them. It would be absurd to preach loyalty to such a scheme on the part of persons condemned to bear for a time the brunt of the contest were it not that there are so many who do show such loyalty, both in their theories of living and in their lives. Mrs. Sophia P. Shaler, in her *Masters of Fate*, records the histories of many eminent literary men of whom this was true, and everyone has seen striking instances, especially perhaps among the blind, not only the congenitally blind but those who have lost their eyesight in adult life. I have one such person in my mind who not only instinctively and systematically refrained from complaining of his loss but continued to refer to the assumed beauty of the landscape and the passage of the seasons, as if fully alive to all the pleasures of the visual sense, and another whose blindness has made her an enthusiastic worker for the welfare of the blind. There are many persons also who, like the sister of Ralph Waldo Emerson, have so cultivated their power of living in the pleasures of others that they could sincerely assert that they regarded it as their best gift. The glowing courage and optimism of men like Robert Louis Stevenson actually fills the veins of all that come in contact with them, to the extent that it is made their own by appreciation, by imitation, and then by use.

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[9] It is true that we aim at an equilibrium, at the abolition of both disease and war, but it is with a knowledge that, to borrow an apt simile, we must content ourselves to spring from one cake of ice to another in seeking a shore which is infinitely distant. To see the whole value of the limited accomplisnment which lies within our limited powers, making sure that it is modelled upon the best scheme, and that, whether sick or well, we make our whole personality count in the issue, is a worthy and should be an inspiring task.

It is true that these familiar instances of courage are often expressions rather of individual character than of devotion to a common cause, and also that the persons among whom they usually occur are not sufferers from depressions, obsessions, and morbid fears, terrible to feel and sapping the very life of one's energy, yet impossible to describe or to defend even when they seem to strangle one's very breath. Fortunately, however, there are many persons who through mustering all their resources have won successfully through these states and can point to the attitude here advocated as contributing to their success.

From such patients the physician learns lessons that his text-books cannot teach, and this for the reason, among others, that the text-book in order to describe must dissect and analyze, whereas the living example is the total expression of many forces, just as one curve, itself simple, may be the resultant of many curves.

I am not now dealing with the whole subject of treatment or I should of course feel bound to speak of the conscious mental life and its disorders as to a definite extent a product of the subconscious mental life and of the physical life and to be reached through them, and also of the fact that many seemingly unendurable symptoms are best managed by looking on them as relatively superficial, as mental tricks, or habit "tics," to be met by skill and knack and guile rather than by force or argument. But as needs and temperaments vary so must modes of treatment, and there are many patients for whom the appeal to the highly developed social consciousness is an appeal of real power. Such persons feel that the problem before them is not solely to get well but also to realize that, sick or well, they are under obligations to show fidelity to leading motives which if generally adopted would develop, first opinions, then sentiments, and then traditions such as would make societies into stronger units. Traditions of this sort are said to animate the Japanese soldier and to have animated the citizens of the Greek republic. The invalid should recognize that he is in the position to make some practical contribution toward the problem which confronted Job, and that this is a worthy object of ambition. Everyone has reservoirs of energy, large or small, that will refill themselves the faster for being intelligently tapped. The stirring address recently published by Dr. William James[10] is a forcible argument for this view. Even a small increase in the sense of power derived from systematized and graduated efforts and a small increase in the sense of fellowship which comes with the knowledge that one is coöperating with others for a definite common end may effect a revolution in the life of the neuropathic invalid.

The problem of illness is more or less like that of "failure." Both make demands upon our intelligence and our faith, and both may properly be regarded like the loss of a battle in a campaign which we expect to be successful in the end; if not successful in the sense of bringing victory then perhaps successful in the sense of having been the best that we could do, and if not that even, then at least of value as affording a contrast with an imagined more successful future effort of ourselves or others. It is difficult to take this attitude, and especially so when the illness is one for which we feel ourselves responsible. It is hard to live contentedly in company with the memory of one's failures especially if traceable to one's faults, but it is absolutely essential that one should learn to do so, and very often the first step toward the relief of the torturing distress of psychasthenic symptoms is to make up one's mind to accept them as necessary companions while at the same time learning to turn as deaf an ear as may be to their words.

For the sake of doing this successfully one may frankly accept and even accentuate the "dissociation" or community conception of the individual. If a man's habits are so strongly fixed that a portion of his mind must be morbid and antisocial or too exclusively occupied with past issues, let it be so and let him be willing to live in company with this portion but only on the condition that he shall not admit it to be his principal self. Each person has the right to decide, and must decide, which of his tendencies he will emphasize and will live by and in. He can do this and can enjoy and reason in despite of the presence of the Siamese twin of his painful obsessions, and forced and distressing thoughts and feelings. This habit of keeping a corner of the mind free from contamination and able to contemplate, as if objectively, the perturbations of the remainder, I have found extremely useful to enjoin. Everyone does this in a measure, but to do it thoroughly and systematically is another matter; yet it is a reasonable ideal aim. Multitudes of people have learned even to make a somewhat scientific study of their troubles, as the artist-poet, William Blake, who took his painful visions as models for his remarkable drawings. Thus a double end is served, knowledge is gained, and one's sense of emotional distress relieved.

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[10] The Energies of Men, Philosophical Review, January, 1907; Science, March, 1907; American Magazine, November, 1907.

An important condition of success in this attempt lies in the recognition of the fact that an illness is less likely to prove a pure misfortune if the patient holds himself ready to issue from the experience with his personal characteristics changed in various respects. He may have to adapt himself to limitations imposed by impaired capacity in some direction (as, conspicuously, in the case of blindness); he may have received a glimpse into some new mental realm or a hint as to some new possibilities in the social order. But whatever it may be, if he is willing to accept the conditions that are offered in the same spirit that he had accepted the best of those to which he had been previously become accustomed, he may find himself unexpectedly rewarded. Some persons do not need this counsel, and feel themselves under a sort of bond to obey the orders of a new set of obligations and possibilities, not only without complaint but even with a perennial cheerfulness, just as an army officer obeys without serious repining the order to change his post of service. It is this spirit that makes the process of growing old often a highly cheerful and interesting one. The leading idea or leading sentiment of one's conscious life may remain the same throughout, and thus the best qualities of youth be retained indefinitely, though the mode in which this leading idea is served may radically change. Dr. William James, in his *Varieties of Religious Experience*, gives some striking instances of the alteration in personal tastes and habits that accompany religious conversion; sometimes the changes that nervous invalidism induces are equally impressive.

The point which I make may appear of slight account, but it is not so. Many persons have a sort of cramp-like dread of any change. They feel as if their individual tastes and pleasures and the particular environmental conditions in which they had grown up formed a sort of sacred edifice which would crumble to its foundations if any part of it were touched. This feeling may be based on habit or on a narrow, selfish view of one's position, a pure desire to retain the personal pleasures which had grown to fill too large a place in one's horizon, or it may rest on an intense affection for the persons by whom one is immediately surrounded, and who stand as symbols of one's own sacrifice and struggle. To be expected to undergo any considerable change, like that of persons who "experience conversion," sometimes seems like being asked to separate one's self in a measure from these companions. Is it, then, likely that the adoption of more broadly social attitudes, entailing the conception of one's self as a member of a larger circle, will diminish the intensity of the closer bond? Perhaps this is for some persons a real danger (although one to be met by obvious means) but the opposite result, namely, the strengthening of personal ties, ought to be the usual outcome. A common reason for this dread of change, at least on the part of persons afflicted with obsessions and morbid fears, is that they have so often suffered from embarrassing situations that they withdrew from the shadow of them with an instinctive horror. They fear novelty above all things and shrink from "getting well" at the cost of "getting different," because it may mean getting worse. Yet it is just these persons who preëminently need all the encouragement and confidence that the habit of boldly facing new conditions, small and great, can bring, and the game of learning the lesson how to do it is well worth the candle.

Like all the pieces of self-discipline here suggested, this is to be studied like any game of skill, namely, first under the influence of the well-grounded sentiment and conviction that the end is a desirable one and the means well planned; next, with a confidence stimulated by imitation; finally—and most important of all—under the constant binding of the new self by as strong and rich ties of association as possible to a new or wider circle of interests, or the old circle conceived in a new light; in other words, by the development of the social consciousness.

The wise person deliberately accepts the conditions which the game imposes on him as the basis for new efforts, learns to live within his resources, endures what he cannot help with a philosophy better than the Stoical, and cultivates the feeling and belief that whether he gains or loses thereby he will throw in his lot with that of his community. It must be admitted that no definite recompense is offered for the sacrifices which this decision may involve. The promptings of one's social consciousness must be followed without too much forecasting of the result or the reward. They cannot be forecast, and fortunately the most deeply instinctive impulses to spontaneous action are to a great extent independent of estimates as to the results of action. They are expressive rather of the constitution of one's personality. Emerson's essay on Self-reliance contains a fine sentence bearing on this point: "When good is near you, when you have life in yourself, it is not by any known or accustomed way; you shall not discern the footprints of any other; you shall not see the face of man;—the way, the thought, the good, shall be wholly strange and new. It shall exclude example and experience," etc.[11]

Among these strong instincts those which have reference to the social consciousness are certainly prominent, and it now remains to indicate certain therapeutic experiments in which these feelings have been drawn upon.

It is a noteworthy and refreshing sign that in the best sanatoriums of the present day treatment by occupation to be followed by a number of patients working in company or on similar lines is counted as of so much value. Perhaps the first important step in this direction was taken by Grohmann, of Zurich, an engineer by training, an educator and enthusiast by nature. His work was warmly endorsed by Moebius, of Leipzig, and he has had many imitators. One of the most successful of these is our colleague, Dr. H. J. Hall, of Marblehead,[12] under whose leadership a notable training-school for workers in arts and crafts has been established, the pupils being mainly neurasthenic invalids, many of whom have been led to sidetrack their troubles, drawn along by new zeal for new accomplishment. The wholesome, natural relationships which such schemes as this make possible, at first between the co-workers themselves, then between the invalids as producers and a widening circle of those interested in the products for their own sake, must constitute an element of great value in the treatment.

Another medical enterprize which secures social relationships of a special and useful sort, incidentally to other aims, is in operation at the Massachusetts General Hospital, where groups of out-patients (thus far mainly patients suffering from tuberculosis) are encouraged to meet regularly, under strict supervision, to compare notes as to their success in carrying out modes of treatment that had been prescribed for them, and to gain interest, information, and enthusiasm for new efforts. I did not at first believe that a coöperative movement of this sort would be available for the neuropathic and psychasthenic patients, but I have changed my mind. Among those who are engaged in carrying on the experiment there are several who have been through the purgatory of nervous invalidism or are still wandering in its circles, and their experiences give them in some respects a peculiar fitness for the task.

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[11] Compare also Schiller's poem, of which the concluding lines are here given, in which he describes the traveller gazing at the land of promise from the bank of the river which he sees no way to cross:

"Einen Nachen seh Ich schwanken
Aber, ach, der Fahrmann fehlt,
'Frisch hinein, und ohne Wanken,
Denn die Segeln sind beseelt.
Du musst glauben, du musst wagen,
Denn die Götter leihn kein Pfand;
Nur ein Wunder kann dich tragen
In das schöne Wunderland.' "

[12] Boston Med. and Surg. Jour., 1905, clii, 29

The case of one of the co-workers in this enterprize has especially interested me because the person in question had been a thorough and critical student of philosophy yet had not found that his studies had yielded him any considerable practical aid as regards the problems of his daily life. No scheme had seemed reliable as a universal guide. He became psychasthenic and passed through a long period of invalidism—not under my care—which he had found it difficult to shake off. Under persistent urging he returned to his studies and recovered, and at last admitted that he had gained a new point of view and one which led him to devote a portion of his time to this practical work.

In a general way the object of this undertaking is the establishing of closer social relations with those who attend the hospital off and on for out-patient treatment than would be possible if the busy doctor and the embarrassed patient were alone concerned. For this purpose a paid agent, or a helper acting under her, visits selected patients in their homes, endeavoring to make sure that the advice given by the physician counts at its full value, to get nearer to the home life of the invalid, and to help toward improvements in conditions discovered to be faulty.

This movement in behalf of neuropathic patients is a recent outgrowth of that which had been in operation for several years under the leadership of Dr. R. C. Cabot.

It is less easy to utilize this principle of coöperation in the interest of a single patient than in those of a group, but observations like that recently recorded by Dr. Sydney Schwab, of St. Louis,[13] shows that it can be done. The case was that of a lady of middle age, highly neurasthenic and neuropathic, but with good literary gifts, for whom Dr. Schwab succeeded in creating a small circle of understanding and congenial friends by whom she was led into pleasant professional relations with a larger circle and thus into more wholesome relations with herself as reflecting the life and needs of many others.

It is a striking fact that side by side with this sort of treatment, which seems so humanizing in its tendencies for the neuropathic patient suffering, wittingly or unwittingly, from social isolation, another method should have arisen, which makes equal claims for success, yet appears to be founded on an obverse principle. This is the method by isolation, well-known to all neurologists since the day it was so well described by its great advocate, S. Weir Mitchell, and since then brought forward from time to time with new modifications in detail, as recently by Déjérine and his followers. Of course the real fact is that the isolation, like the daily hour of meditation of the tranquil Hindoo, is only suited for a brief period, and careful readers of Dr. Mitchell will recall that he did not consider his labors ended until he had enjoined upon his patients a life adapted to their powers of active usefulness.

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[13] Jour. of Nerv. and Ment. Dis., August, 1907.

These two modes of treatment are then really not so very different from one another. Nevertheless I believe that the latter portion of Dr. Mitchell's teaching is followed with less care than the other portions. This should not be the case. Even the treatment by occupation, by side-tracking of distressing symptoms, makes conscious coöperation with others a matter of secondary importance, and in this respect is open to improvement. Side-tracking and even recovery are not the only issues at stake. Much pains may well be taken to make the patient feel his social obligations at their full value.

If these principles are important for the adult invalid, as a means to his recovery, they are doubly so for children, if only as a means of guarding them against some of the causes of the nervous breakdown in adolescence and adult life.

Finally, I wish to refer briefly and for special reasons to a few private observations of my own.

I have especially in mind the case, which may stand as typical of a group, of a lady of intense and ardent temperament but delicate physical health, who passed in early life through several exciting, emotional experiences, one of which in particular was of a sort to make a deep and painful impression on her mind. She was always inclined to introspection as well as to really profound inquiries into questions of religion and philosophy. Being very high-minded, and at the same time sensitive and impressionable, and being under the necessity as well as the desire of working at the limit of her strength, she became a teacher, and gained success and credit. Finally she broke down, perhaps more under the stress of hereditary weakness than that of outward pressure, and became melancholic, with, at one time, a marked tendency to suicide. She was placed in a hospital for the insane for a long period, and since then has had a number of recurrences of her illness, from one of which she is now suffering.

The special reason for which I report the case is that this lady, like John Bunyan whose inward struggles were in some respects analogous to hers, and like a number of other persons whose histories I have in mind, gradually gained a surprising amount of control over her emotions and her thoughts, so that she often exhibits for long periods at a time an amount of stability which few physicians who knew her at the earlier period would have thought possible. Not only this, but in the course of the many long conversations which I have had with her she has been able to assure me that she feels no regret for the experiences through which she has passed, not even for the painful event before alluded to, which might have been counted greatly to her discredit in a social sense. In other words, she seems to me to have exemplified the possibilities of an outcome of illness and trial which, in my opinion, should be regarded as in the best sense its only proper outcome. The fact that her disease is at times too strong for her should not count as equivalent to failure. The limitations imposed by sickness were for this patient a means of securing results which otherwise they scarcely could have reached, and this is not uncommon. The person who recovers after a long period of nervous invalidism is apt to recover with temperament and character of a new sort. It is often fortunate that this is so; and it is the voluntary resistence on the part of the patient to any change, it is his insistence on considering the restoration to his former self as the only condition upon which he will count himself as well, that often chiefly works to make an even relative cure impossible.

The lady whose story I have briefly sketched[14] is always associated in my mind with another whose experiences were much the same, both as to inward struggles in the past and as to eventual emergence with individuality and character of increased strength and poise, while both have continued to devote their time and talents to the public welfare. It happened that I asked both of them to what influences they mainly attributed their relative recovery, and both promptly answered, "To philosophy and religion." The answer carried a meaning in both cases that the words would not necessarily convey. Many persons speak of philosophy and religion for whom both influences have an uncertain meaning. Their philosophy may be crude and their religion is quite likely to be conventional and exclusive. With these patients, however, the benefits referred to philosophy were based on a very thorough study of that science, while the religious convictions of both, while deeply seated, were eminently free from narrowness or superstition. These patients were eminently persons with whom the *general principle*, the mental attitude, the point of view, counted as agencies of great power. One often sees patients who get well after protracted periods of nervous invalidism, but only through the intervention of some *individual*, layman or physician, whose personal influence, masterful or persuasive, as the case might be, strongly tended to make the outcome possible. This is all right if the individual in question is constantly engaged in the effort to make himself eventually unnecessary, but it is peculiarly edifying to see patients who reach an effective guiding principle largely by their own efforts and through the value of the ideas by which they have been led. Physicians might be the repositories of these ideas oftener than they are.

The mention of the two patients to whom I have alluded leads me to make some further reference to the matter of religious influence, which with them counted for so much. Physicians are under peculiar obligations, as it seems to me, in view of the immense and varied influence that the religious sentiments exert, to fit themselves for studying the religious consciousness from several points of view. Whatever else these sentiments may stand for in a given case, they stand theoretically for the social consciousness in its most highly developed and universal form, and therefore are of prime importance.

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[14] Both these patients had social consciousnesses of a high order and were continuously devoted to the social welfare.

Physicians are bound to keep themselves ready to understand the points of view even of those with whom they are not in intellectual sympathy. Not only this, but they are bound also to analyze and to estimate, as students of science in the largest sense, the relative value of the different motives and emotions to which the religious sentiment gives rise. Finally, physicians should not be led through their loyalty to natural science to feel that there is no other scientific mode in which the truth can be expressed. Philosophy and metaphysics likewise have their claims.

The best measure of social progress is to be found in an analysis of the relationship that obtains between the individual and the community, and this is as true with regard to questions of invalidism as with regard to questions of political progress or questions of labor and the distribution of wealth.

We rejoice to see the invalid bear his troubles with courage and in silence, as if they were of significance to him alone, but it is more edifying, and a sign of a better civilization, to see him sustained in bearing them and in attempting to overcome them, by the feeling that in so doing he is working, as an individual, to be sure, and in that sense alone, but with and for the community, in the largest sense. It is important that the physician should find means of making his patients feel, as far as practicable, that they can coöperate, in spirit if not in flesh, in making such an outcome possible. If nothing more, they can create a background of sympathy.[15] It is not all the elements of a chord of music that are separately distinguishable to the ear,

> "Nor knowest thou what argument
> Thy life to thy neighbor's creed has lent."

It has been questioned whether the sentiment of loyalty is as effective an influence as it should be, in our community and in this day of somewhat misunderstood individualism. If this is so there is the more reason for accentuating the importance of coöperative social efforts in the therapeutics of nervous invalidism. Then such arguemnts as that expressed in the well-known lines of Arthur

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[15] "A shipwrecked sailor buried on this coast
Bids you set sail.
Full many a gallant bark,
When we were lost,
Weathered the gale."
(Greek Anthology.)

Clough may come to be widely accepted as standing for an appeal of real cogency:

> "Say not, the struggle not availeth,
> The labor and the wounds are vain,
> The enemy faints not, nor faileth,
> And as things have been they remain.
>
> "If hopes were dupes, fears may be liars;
> It may be, in yon smoke concealed,
> Your comrades chase e'en now the fliers,
> And, but for you, possess the field."

THE CURABILITY OF A RARE FORM OF NOCTURNAL PETIT MAL BY THE USE OF LARGE DOSES OF BROMIDE.

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Rapidly recurring nocturnal petit mal is a rare form of sleep epilepsy which occurs both independent of, and in connection with, grand mal seizures. The general exhibition of the type is the same whether associated with grand mal or not. Herpin called this type "intractable" epilepsy—epilepsy defying all medication. No author has made extended comment on the condition. Bromides, as ordinarily administered, invariably increase the attacks. This fact has caused many observers to diagnosticate the state as a form of hysteria, a disorder of sleep, such as pavor nocturnus, somnambolism, and the like. I have seen but 4 cases of this type of epilepsy among several thousand cases. Aside from the peculiarity of the attack, the epilepsy in which the seizure occurs does not differ in causation or course from idiopathic grand mal. However, its termination under specific treatment is quite different. As is well known, grand mal epilepsy is usually infrequent in cases that show bizarre or fragmentary attacks.

The attacks of nocturnal petit mal invariably occur while the patient sleeps, either by day or night. Usually, as soon as the patient falls asleep the attacks begin. There may be as many as three hundred separate and distinct attacks in a single night. The patients usually awaken from deep sleep, the eyes are opened widely; the pupils are dilated and irresponsive to light, the head is moved from side to side. There is an anxious and furtive look in the face. The face may be congested or very pale, and is usually the one or the other to an extreme degree. In a few seconds after the onset the patient executes some incredibly rapid movements of the hands or feet, but with no clear intent or purpose, such as is seen in somnambulistic states. For instance, the patient drums on the bed, executes kicks aimlessly in space, beats his head, thigh, or chest in a senseless way. He may spring in the air or turn somersaults rapidly. Sometimes patients exhibit attention when spoken to, but they make no coherent reply. Unless disturbed, the patient soon passes into normal sleep at the end of the attack.

Case I.—My first patient had two hundred similar attacks during the night. I made the following note: The patient suffered a mild attack at 9.20 a.m. (He had retired at 8.30 a.m., and was sleeping by day.) The patient was rather restless in his sleep; occasionally he opened and closed the hand and twitched the feet. At the onset of the attack he opened his eyes in a wild, frightened manner and lay quietly for about five seconds; the pupils dilated widely, and upon application of the light test the patient was startled and closed the eyes several times, but the pupils remained irresponsive to light. He then sat up in bed, clutching the mattress. He flexed and extended the legs rapidly. The lips were drawn back from the teeth, and the teeth were tightly closed in a demoniacal grin; he slowly turned his head from side to side several times. With three jumps or hitches he then moved down the mattress while in a sitting posture. He gripped the mattress again, and moved quickly backward to the head of the bed in the same sort of manner as he had moved down from the head. He repeated this entire movement three times. The patient then sat still for five seconds, but with the facial expression unchanged. The attack then ended in perfect and instantaneous consciousness. The pupils readily responded to light. The whole phenomenon had lasted but thirty seconds. Five minutes prior to the attack his pulse and respiration were normal, but during the attack his respiration was rapid and very heavy, almost stertorous; and one minute after the attack his pulse was 94 and respiration 22. The face, which was highly congested during the attack, remained somewhat flushed after the seizures.

The patient had but two typical grand mal epileptic attacks in as many years. Bromides in ordinary dosage (60 to 120 grains daily) were not only ineffectual in controlling the attacks, but actually increased the number of paroxysms threefold over that of the non-sedation period. The case had been repeatedly diagnosticated as a form of grand mal hysteria associated with grand mal epilepsy; but by placing the patient under close observation the so-called hysteric attacks were proved epileptic in character and of the paroxysmal waking type, a form of rapidly recurring petit mal. The patient was finally given bromides in high dosage. The attacks increased in severity and frequency while taking the bromides from 30 to 130 grains daily, but on a daily dosage of 130 to 230 grains the seizures became less frequent and severe, and finally ceased altogether after five days' treatment at 400 grains daily. The high-dosage experiments finally showed the sedative level was 230 grains, at which amount medication was sustained for several months. The patient had no more awakenings nor any other epileptic manifestation whatever, and he is now in excellent physical and mental health, which is in marked contrast to his former hopeless state.

Case II.—My second patient had attacks nearly similar to those just described for Case I, but he never presented any form of grand epilepsy. The rapidly-recurrent petit mal constituted the only form of epileptic attack. This case, as that of Case I, had been persistently diagnosticated as hysteroepilepsy. This diagnosis was believed to be correct because of the character of the attack and the failure of bromide treatment to reduce the condition. Bromide had never been given above 60 grains daily. After close observation for several weeks, the epileptic nature of the seizures was disclosed by the unconsciousness, pupil test, etc., which diagnosis was confirmed by bromide treatment in high dosage. The awakenings ceased entirely, but, as is usual in such cases, the number of attacks increased in frequency while under smaller doses of the drug. The necessary dose to suppress entirely the nocturnal petit mal in Case II was 230 grains; later, the bromide sedation level was found by experiments to be 160 grains. The patient has now had no seizures nor any epileptic manifestations whatever for more than two years. There has been marked mental and bodily improvement.

Case III.—The third case was that of an idiopathic epileptic who had but two grand mal seizures in eight years. She had been classed as a hystero-epileptic, and because of such diagnosis she was without proper bromide treatment for years. A sample of her attacks is as follows: At 1.30 a.m. the patient awakened suddenly, rolled out of bed, throwing her arms, head, body, and limbs about violently, inflicting bruises, principally on the face, legs, and feet. The eyes were widely opened; the mouth opened and closed forcibly, expelling air from the lungs at each opening of the mouth; the hands grasped anything within reach; there was a marked pallor of the countenance. There was no convulsion. The awakening lasted twenty seconds; the patient then jumped to her feet, perfectly conscious, went to bed, and composed herself to sleep. Axillary temperature immediately after was 100°, pulse 128, respiration 25. The patient denied any knowledge of what had occurred when asleep. The patient remained quietly in bed, sleeping soundly between attacks. Another attack of about the same character occurred at 5 a.m., which, however, was followed by profuse perspiration over the entire surface of the body. Temperature normal, pulse 118, respiration 24. I failed to observe any rigidity of muscles in any of the attacks. At 6 a.m. patient had a third attack. Usually the attacks occurred, from ten to twenty in number, whenever patient fell asleep, either by night or day. Under moderate bromide dosage the poroxysms increased in frequency, but under high dosage

(130 to 180 grains) the attacks ceased entirely and have not recurred. She now takes but 110 grains of bromide daily. Bodily and mentally improvement is marked under the sedation treatment, in striking contrast to the former critical conditon.

Case IV.—The fourth patient, a young man aged twenty-six years, had had his epilepsy since his ninth year. After the first four years of his epileptic career he began having rapidly recurrent nocturnal petit mal, having ten paroxysmal awakenings nightly. He slept fourteen hours daily, and yet "often looked and felt haggard." He lost flesh steadily, and, although over six feet in height, weighed but 113 pounds. The attacks occurred in a few minutes after falling asleep, even when he dozed in his chair during the day. He suddenly awakens, glances from side to side with an expression as though he were in search of something. The face assumes a painfully-frightened appearance. The patient then lifts himself to a half-sitting posture and either mutters a senseless jargon or expectorates violently several times, whirls himself forcibly over and over and finally, with a long-drawn sigh, falls into deep and natural sleep. During these attacks patient is unconscious, but may be easily aroused. Pupils are widely dilated and are totally irresponsive to light test. The face may or may not be congested during the attack. There is no after-remembrance of dreams upon awakening, and the patient often asks to be allowed to sleep by day, so as not to disturb his relatives. If he sleeps by day, the same phenomenon occurs as at night. Patient was cured of these attacks entirely by bromides in high dosage, 200 grains daily. After six months' absence of attacks, bromide was reduced to 140 grains daily. Until a daily dose of 185 grains of bromide was given, the patient's nocturnal petit mal increased in suddenness and frequency to a frightful degree; as many as four hundred attacks are known to have occurred nightly. Many more must have occurred unobserved. At 185 grains of bromide daily the seizures suddenly and entirely disappeared. Patient had occasional grand mal attacks during the early years of his epilepsy.

There were no stigmata of hysteria in any of the cases.

While all of these cases may relapse in time, yet an immunity from paroxysms for several years or more is a great advance over the rapid deterioration threatened.

The principle of high dosage of bromide may be stated as a form of hyperbromidism, bromide intoxication, or poisoning. The drug is given in a steadily-increasing dose, as that of iodide in specific disease. The patient has high rectal irrigation once or twice daily to reduce the amount of congestive catarrh, eliminate toxins induced by faulty metabolism or deficient oxidation, and for its diuretic effect. The patient is also given prolonged hot packs and baths at night for diaphoretic effect, and cold douches, sprays, and cold drip-sheet treatment mornings to stimulate the peripheral sensory nerves and to preserve vasomotor tone. Vigorous deep massage is steadily maintained to cleanse the muscular circulation. The inordinate tendency to local stasis of circulation in the skin and its consequent depression of the skin function shown in acne, etc., is corrected by face packs, hot moist bran applications, and mild stimulation of ointment applied at night. Mouth and nasal cleanliness, occasional lavage of the stomach and large quantities of aërated vichy (two or three quarts daily) are absolutely necessary. Respiratory gymnastics are not forgotten. Oxygen inhalation and transfusion have not been found necessary, but might be in some cases. Incipient heart failure may be gauged by the second pulmonic sound and the degree of splitting of the second tone. The latter is easily controlled by strychnine and digitalis. It is unnecessary to say that the food is always light, highly nutritious, but not too concentrated. No meats are allowed.

In brief, it may be said that an extreme impregnation of the cortex is aimed at, while the somatic effect of the bromide is reduced to the minimum. The treatment above outlined fixes, in the nerve tissues, the greatest amount of bromide possible. One should never wait for the signs of bromide intoxication, but begin all the precautionary treatment at the start, as in the treatment of simple epilepsy. Time will thus be gained in pushing the sedation to an early and favorable climax.

These attacks of paroxysmal awakening are of timely interest, in view of the fact that the extension of the term hysteria by the French school is fast threatening to engulf many, if not all, of the disorders of sleep. There can be no doubt that the type of paroxysmal awakening, which I have briefly outlined, is a rapidly recurring petit mal form of sleep epilepsy. It may resemble forms of hysteria, somnambulism, or nightmare, to all of which it may be closely allied, but its epileptic nature is none the less certain. It is as definitely epileptic in character as classic grand mal. It is a sleep disorder in epilepsy analogous to the epileptic sudden somnolence of Semmerling, which form of epilepsy, it may be recalled, attacks the patient during waking hours.

The most practical and interesting fact regarding this form of epilepsy is its ready subjection by large doses of bromide. This point is especially urged, notwithstanding so many writers of today are vehemently urging the decrease of all bromide medication in epilepsy. Why the small doses of bromide actually increase this form of sleep epilepsy is very difficult to explain. It is possible that small doses may only lower cortical inhibition without exerting sufficient sedation on the motor centres in the cortex.

While it is highly gratifying to know that this peculiar and rare type of sleep epilepsy is most amenable to amelioration or cure by extreme bromide medication, the care and attention that such cases must necessarily receive during the medication, cannot be too thoroughly insisted upon.

THE ACTION OF THE NITRITES ON THE HEART.

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(From the Laboratory of Experimental Therapeutics, University of Chicago, S. A. Matthews, M.D., Director.)

The use of the nitrites as therapeutic agents in medicine has passed through the stage of commendation, has been followed to some extent by a period of disuse, much as other remedies of importance have been forced to do before their physiological action has been placed on a sound basis by proper experimental observations. At one time this class of drugs, especially the nitrite of sodium, was extensively used in disease of the kidneys associated with high arterial tension. When used for a long time it apparently caused a reduction of the high tension seen in these cases of chronic Bright's disease. Later on the very pronounced action of amyl nitrite in lessening the arterial spasm in angina pectoris and in relieving the attacks was demonstrated by Sir Lauder Brunton. The establishment of this action served to bring the nitrites into great favor, and at the same time served to formulate a theory as to the cause of the anginal attacks. Since this time this group of drugs has been employed for the relief of a great variety of morbid conditions, which generally have had as their most marked symptom a spasm of involuntary muscle tissue, especially that of the smaller arteries.

The physiological action of the nitrites is exerted chiefly upon the bloodvessels and the blood. They produce a decided dilatation of the arterioles and smaller veins, bleeding, as it were, a person into his own vessels, and causes as a result a pronounced fall in blood pressure. The method by which this change is brought about has been proved to be due to the action of the drug on the vessel wall, and not to any influence it might exert upon the nervous mechanism of the vessel. This change in the vessels is especially marked in those of the splanchnic area and the head. This same influence is also exerted on the coronary vessels, and is a point of importance which will be referred to later.

The changes in the blood are marked, and consist chiefly in a conversion of the hemoglobin into methemoglobin and a mixture of methemoglobin and nitric-oxide hemoglobin. This change is not so pronounced in man as in some of the lower animals.

The poisonous effect of the nitrites seems to be due to their action on the hemoglobin in paralyzing the oxgyen-carrying power of the blood.[1] It is usually supposed that the nitrites, in addition to their above stated action on the bloodvessels and blood, have a depressant effect on the heart muscle.[2] The object of this paper is to question this last part of the nitrite action and to demonstrate an increased efficiency of the heart by their use in certain cases.

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[1] John Haldrane. Jour. of Phys., vol. xxi, p. 189.

The nitrites have an evanescent action in the body. The very volatile preparations, such as amyl nitrite, exert their influence rapidly and quickly pass off, while such preparations, as sodium nitrite, which are not volatile, gradually give rise to the nitrite action, and this persists for some time and gradually disappears as the drug undergoes oxidation. In the duration of its action nitroglycerin takes a place midway between these two extremes.[3] The amyl nitrite action is noticed in ten seconds after its administration and lasts about two minutes. Nitroglycerin given in doses of 1 minim of a 1 per cent. alcoholic solution reduces the pulse tension in two minutes and keeps it below normal for about two hours. Sodium nitrite given in the dose of 2 grains begins to reduce the tension in the normal pulse in from three to four minutes, and its maximum effect is seen in fifteen to twenty minutes; this effect lasts from two to three hours.

The deductions arrived at in this paper are largely due to a series of experiments on the action of nitroglycerin on the circulation of the dog. Dogs varying in weight from six to twelve kilos were used. The average dose of the drug was 0.5 to 1 c.c. of a 1 per cent. alcoholic solution of nitroglycerin injected into the femoral vein. During the experiments, a constant record of the blood pressure was taken from the carotid by a mercury manometer, and the heart's action was recorded by Matthews' modification of the Roy-Adami myocardiograph. As many old dogs as could be obtained were used in the experiments in order to determine if there existed any variation in the action of the drug on animals with young hearts and vessels and in those whose circulatory apparatus had undergone some degree of degeneration as a result of the wear and tear of living. It is interesting to note that in practically all of the old animals there was a difference in the action of the nitrites. This will be discussed later.

Experiment I,—Old dog. Weight about 10 kilos. It was difficult to anesthetize this dog with any degree of safety, both on account of failure of the respiration and the heart. Upon inspection it was seen that the heart was slow, moderately dilated, and flabby. The muscle had an anemic appearance. As seen from the tracings, the oscillations in blood pressure were very marked, resembling a good deal those produced by slight vagus stimulation. The blood pressure was 120 mm., the heart beat 60 per minute. 0.33 c.c. of a 1 per cent. alcoholic solution of nitroglycerin was injected into the femoral vein. The blood pressure dropped to 80 mm. and the oscillations began to approach a more normal type. In thirty seconds the blood pressure was 140 mm., and from here on the blood pressure continued to be 140 mm. The myocardiograph tracing showed in the normal a systole of 7.8 cm. and a diastole of 10.5 cm. as measured from the base line. During the rapid fall in blood pressure, as measured from the base line, the systole showed a measurement of 7 cm. and the diastole a measurement of 11 cm., thereby increasing the amplitude of the heart's beat. At the point where the blood pressure reached 140 mm. the systole showed a measurement of 5 cm. and the diastole a measurement of 8.5 cm. This change in the heart's contractions was brought about by a decrease in the diastole and an increase in the systole. The appearance of the heart changed from a flabby and anemic organ to one with a normal color and with forcible contractions.

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[2] Leech, Croonian Lectures. British Med. Jour., July, 1893, p. 6.

[3] Broken up in the presence of alkalies into a mixture of nitrates and nitrites.

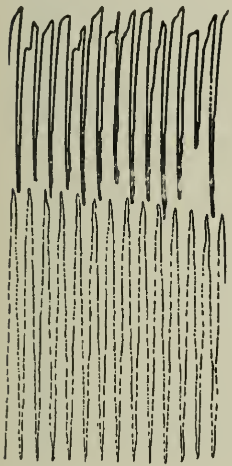

Fig. 1

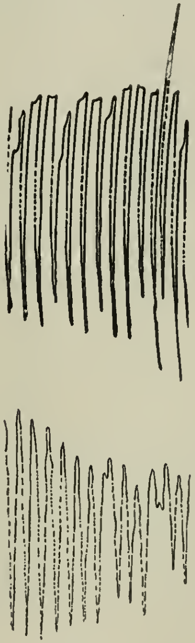

Fig. 2

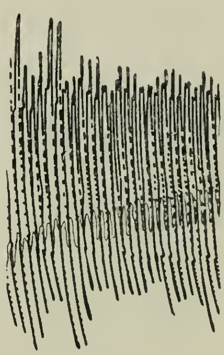

Fig. 3

Fig. 1.—Shows the normal blood pressure and myocardiograph tracings of the right ventricle, and the marked oscillations in blood pressure. Read from left to right.

Fig. 2.—Shows the increased systole and the blood pressure oscillations approaching a more normal type.

Fig. 3.—Shows the rise in blood pressure and the continued improvement in the systole with a decrease in the diastole.

This experiment shows, in the first place, a decided, but temporary, fall in blood pressure, lasting twenty seconds. At first an increase in the systole with a slight increase in diastole. Following the rise in blood pressure the systole continues to increase, but the diastole to decrease. (Figs. 1, 2, and 3.)

The decided changes produced in the efficiency of the heart's action of this animal cannot be taken as the usual effect of nitroglycerin. For some reason the changes were more marked than any of the other tracings show. The results in this experiment serve to show in an exaggerated form the influence of the nitrites on the heart. In all of the fifteen experiments the same result could be obtained, though in a less pronounced degree. This can be seen by an inspection of the table containing the data derived from the old dogs.

Experiment II.—Young dog. This animal weighed six kilos. The experiment was conducted in the same manner as that described for the old dog. As shown by the table, the systolic contraction measured from the base line was 8 cm., the diastolic 11.6, the excursion of the lever 3.6, the number of contractions in ten seconds 33, the blood pressure 100 mm. Ten seconds after the injection 0.5 c.c. of a 1 per cent. solution of nitroglycerin the heart showed a systolic contraction of 8.5 cm., a diastolic contraction of 12 cm., an excursion of the lever of 3.5 cm. The number of contractions was 30 per second, and there was a blood pressure of 40 mm. Thirty seconds after the administration of the nitrite there was a systolic contraction of 8.5 cm., a diastolic of 11 cm., and an excursion of the lever of 3.1 cm. The number of contractions was 25 per second and the blood pressure was 94 mm.

The protocols (Tables I and II) of experiments on young dogs are appended. An analysis of the protocols of the old and the young dogs will show the following differences in the action of the nitrite: First, the blood pressures, as a rule, were higher in the young than in the old animals. The nitrites produced a more marked fall in the blood pressure of the young than it did in the old dogs. Regarding the comparative effect of the drug on the heart's action, first the rate was generally increased in the old dogs, the systole was increased, the diastole diminished, and the extent of the contractions as indicated by the excursions of the lever was generally increased. The action of the drug on the heart of the young dogs showed first very little change in the rate; the systole was but slightly influenced; there took place an increase rather than a decrease in its efficiency. The diastole was also but slightly affected. The excursions of the lever showed a decrease in their extent, which, on the whole, would indicate a slight lessening in the output of the heart. This is just opposite to the results obtained in the old dogs. In both cases the tendency of the heart is toward an increased systole, which physiologically means an increased efficiency and would not indicate any depression of the heart muscle.

The differences noted between the response of the old and the young dogs to nitroglycerin are what might be predicted. In the young animal the vessel walls are perfectly elastic and the heart is working against a load perfectly adapted to the strength of the organ. The

TABLE I.—*Effect of Nitroglycerin on the Heart and Blood Pressure of Old Dogs.*

Time.	Distance of systole from base line in cms.	Distance of diastole from base line in cms.	Excursion of the writing lever.	Number of contractions in 10 seconds.	Height of blood pressure in mm.	Remarks.
1. Normal . . .	7.8	10.5	2.7	10	110	0.3 c.c. spts. glonoin.
10 seconds after injection. . .	7.0	11.0	4.0	11	7.0	
30 seconds after injection. . .	5.0	8.5	3.5	20	140	
2. Normal . . .	6.2	8.6	2.4	21	94	0.5 c.c. spts. glonoin.
10 seconds after injection. . .	6.7	8.8	2.1	29	30	
30 seconds after injection. . .	5.6	8.9	3.4	30	74	
3. Normal . . .	7.7	10.8	3.1	23	70	0.5 c.c. spts. glonoin.
10 seconds after injection. . .	7.8	11.0	3.2	25	40	
60 seconds after injection. . .	7.5	10.2	2.7	22	64	
4. Normal . . .	8.2	11.4	3.2	24	64	0.5 c.c. spts. glonoin.
10 seconds after injection. . .	8.3	11.5	3.2	30	24	
60 seconds after injection. . .	6.8	10.0	3.2	30	35	
5. Normal . . .	8.0	9.2	1.2	30	72	0.5 of 1 c.c.
10 seconds after injection. . .	6.6	9.6	3.3	38	46	
40 seconds after injection. . .	6.4	9.7	3.3	34	80	

TABLE II.—*Effect of Nitroglycerin on the Heart and Blood Pressure of Young Dogs.*

Time.	Distance of systole from base line in cms.	Distance of diastole from base line in cms.	Excursion of the writing lever.	Number of contractions in 10 seconds.	Height of blood pressure in mm.	Remarks.
6. Normal . . .	8.0	11.6	3.6	33	100	0.5 c.c. spts. glonoin.
10 seconds after injection. . .	8.5	12.0	3.5	30	40	
40 seconds after injection . .	8.5	11.6	3.1	25	94	
7. Normal . . .	8.0	11.8	3.8	30	136	0.5 c.c.
10 seconds after injection. . .	8.6	12.4	3.8	29	84	
1 minute after injection. . .	7.5	10.7	3.2	24	120	
8. Normal . . .	7.6	9.1	1.5	26	120	0.5 c.c.
10 seconds after injection . . .	8.1	9.4	1.3	30	46	
1½ minutes after injection. . .	7.3	8.4	1.1	25	100	
9. Normal . . .	4.8	7.4	2.6	28	110	0.5 c.c.
10 seconds after injection. . .	5.0	7.7	2.7	33	52	
1½ minutes after injection. . .	4.7	7.2	2.6	30	80	

nitrites entering such a system cause a relaxation of the musculature of the vessels and relieve the heart of a portion of its work. This would naturally give a fall in the blood pressure and would cause a slightly greater contraction of the heart, just as the contraction of the skeletal muscle will be greater under a minimum than under a maximum load in such cases. We should not expect the heart to undergo a marked reaction. In the first place, the heart is not working against a maximum load, it has not had to call upon its reserve, and therefore a lessening of its burden would not be followed by any great increase in its contractions.

In the old flabby heart, as shown in Experiment I, the organ was evidently working against a resistance which had called upon its reserve and was requiring too much of its energy. In this case the vessels had undergone a certain degree of sclerosis[4] so that they would not respond to the same extent by dilating as would the normal vessels. The lessening of the load that the heart was working against would show a greater degree of change, in that the heart would be placed in such a condition that it would work against a load more nearly adapted to its strength. This would be indicated by an increase in the systole and by a lessening of the diastole, which would produce an increased output of the heart. The degree of increase in the systole is greater than the decrease in the diastole. The circulation is somewhat augmented by the increased rate and force of the heart.[5] This would further mean that while the heart is working against a diminished load, its supply of nutrition remains unchanged, or if the coronary vessels undergo a dilatation as the other vessels do, it would give the organ while at rest more nutrition, all of which would tend to raise the efficiency of the heart's action.

Another point which it might be well to speak of in this connection is a certain antagonistic action the nitrites have to digitalis and to strophanthus. These drugs, especially strophanthus, greatly increase the irritability of the heart muscle, causing it to contract more forcibly and to a greater extent.[6] They cause also a contraction of the arterioles, which results in a marked rise in blood pressure. This increased irritability of the heart muscle plus the increased resistance means an increased call upon the energy of the heart which may lead to fatigue. If the heart is tending toward fatigue under the influence of these drugs, nitroglycerin will lessen the load of the heart, and this will permit the heart to work longer and more efficiently in its irritable condition than would be possible under a very high blood pressure.[7]

In the later stages of heart disease, whether due primarily to change in the valves, heart muscle, or arteries, there comes a time when the heart has used up its reserve force and begins to dilate. There occurs a train of symptoms indicative of a decrease of the force behind the circulation. When such changes occur from a primary disease of the heart, they not infrequently develop gradually, while when due to kidney inefficiency resulting in a retention of some toxic material which likely causes a sudden vascular spasm, too much work is suddenly thrown upon the heart, and a rapid dilatation ensues before the organ can adapt itself to the new demand. In such cases, in order to bring about a restoration of the heart action there are two alternatives: either to lessen the amount of work the heart has to do, or, by judicious stimulation, to increase the functional activity of the organ to such an extent that it can meet the new call that has been made upon it and properly perform its function.

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[4] A histological examination of the heart muscle, coronary arteries, and aorta was made to determine this supposition.

[5] A. W. Hewlett. Jour. of Med. Research, vol. xv, No. 3, p. 391.

[6] MacNider and Matthews. Amer. Jour. of Phys., October, 1907.

[7] C. R. Marshall. Jour. of Phys., vol. xxii, p. 19.

It is not the purpose of this paper to discuss the various remedies which may be used to bring about this restoration of the circulation. In the large number of cases of embarrassed heart action which develop more or less suddenly from acute Bright's disease and during the course of chronic Bright's disease, the nitrites should be of distinct value as therapeutic agents. Their primary and most marked effect is to dilate the smaller arteries and veins, lower the blood pressure, and remove some of the resistance offered to the overworked heart. The work of the heart is temporarily lessened. If their action stopped here, or if they depressed the already embarrassed heart muscle, their use would undoubtedly do harm. But if at the same time the work of the heart is lessened, and if the systole is increased and the diastole lessened, no harmful influence, but a beneficial one, could come from their use in such emergencies.

I wish to express my sincere thanks to Dr. S. A. Matthews, Director of the Laboratory of Experimental Therapeutics, for his aid and many helpful suggestions during the preparation of this paper.

OTITIS MEDIA AND ITS TREATMENT.

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The general practitioner is familiar to some extent with most of the so-called specialties, and feels that he is competent to care for properly patients with minor gynecological, surgical, or nose and throat affections; but diseases of the eye and ear are usually neglected by him. It is true that the field of the general practitioner is very large, and he must draw the line somewhere as to what he will undertake if he expects to have more than a nodding acquaintance with that part of the work which he does consider within his province. In his daily life he soon finds that some special preparation and equipment along several lines is very necessary, and we find among the general practitioners competent clinical microscopists, expert physical diagnosticians, adepts in pelvic diagnosis, and so on; but how rarely one sees a general practitioner who can manipulate a head mirror so as even to direct the ray of light into an ear, much less to see and understand what he sees there. Yet it is likely that in the average practice affections of the ear of greater or less importance are quite common, much more so, for instance, than cases of appendicitis, or enlarged prostate, or diphtheria, and it must follow that just in that proportion the proper understanding of those ear conditions and the ability to recognize and treat them is important to the to the general physician. The possible serious consequences of the diseases I have cited command for them much respect, and in this particular they may be judged to be ill chosen, but I venture the assertion that more present and future suffering and unhappiness, and, looking far to the future, more lives, will be saved by the practitioner who properly recognizes and cares for his acute ear cases than by one who recognizes early and treats properly his cases of appendicitis.

To learn to use the head mirror and ear speculum so that the ear drum can be seen is a matter of a little practice, and not half so difficult as many of the things demanded of us in auscultation, pelvic diagnosis, certain surgical procedures, etc. The method is fully described in text books, and I need only mention the abundant opportunity which every physician has of practising it. With office patients especially, who can be brought to the light, one additional minute will serve for an inspection of the ears; and without the patient thinking anything but that he is being carefully examined, one can soon acquire dexterity in the manipulations, ability to see into all sorts of ears, and a thorough familiarity with the normal drum. To those in large cities, where special clinics abound, the problem is even simpler.

When undertaking to examine the ear, the light is of great, if not first, importance. In my experience the best light is that from the fiber mantel of the Welsbach and similar gas lights. These are now adapted to lamps, and are very good for office work. Good daylight is satisfactory, but so variable as to be impracticable. The most convenient light is the electric, as a cord and lamp can be carried in one's satchel and used at the bedside, where most of the examinations will be made. The best electric lamp is the so-called ophthalmological lamp, with a spiral filament so arranged as to give a very brilliant disk of light. If this is not to be had, a frosted bulb should be used, as the clear glass lamp of the ordinary type gives confusing lines of light across the field. If electricity is not available, an oil lamp with a large flat flame, turned with the flat side toward the examiner, is satisfactory for bedside work. Without sufficient light, good work is impossible.

The best head mirror is one of about eight-inch focus. Head mirrors, as usually made, have a much longer focus than this, and as one must be close to the ear to see well, the field to be inspected is not at the point of greatest illumination, as it is with a mirror of eight-inch focus. Mirrors are now to be had with large openings, 1.5 to 2 cm. in diameter, and these are easier to use than those with the small hole 1 cm. or less in diameter. One must look through the hole, as the line of sight and the line of light must coincide to enable one to see the bottom of the canal.

With adults, the patient can be put in any position the examiner wishes. Children should be held in the following manner: To examine the right ear, seat the child sideways on the nurse's lap, with its left side against the nurse's body. Pass the child's left arm around the nurse's body under her right arm. The nurse's right hand grasps the child's right hand and right thigh, holding both firmly, with the thigh flexed on the body. The nurse's left hand is pressed on the child's right parietal region above the ear, and the head is pressed firmly against the nurse's body. While this is probably not quite so good as wrapping the child in a sheet, yet, with someone to hold the child who has a moderate endowment of physical strength, it answers the purpose very well and much better than any other method that I have tried of holding a child. It is necessary to admonish the nurse to "hold the child firmly till I am through," as the tendency is to turn the little one loose when the examiner's attention is momentarily directed from the ear, when the whole performance of getting everybody in position has to be gone over again, a thing wearing on the patience and tempers of all concerned.

The examination of the ear of a little child is not easy. To begin with, the smallest speculum of the sets as usually supplied is too large, and this should be borne in mind in buying a set. The already small canal is often encroached upon by deposits of cerumen and flakes of epithelium on the walls of the canal, and these tend to be scraped up by the end of the speculum, and obstruct the view. Patient use of the syringe and applicator are necessary, and while the latter may be a little less gentle, it is, in my experience, more satisfactory to wipe the ear with a little cotton twisted on the applicator and wet, than to try to cleanse it with a syringe. This applies to the accumulations of epithelium and cerumen, rather than to purulent discharges, which are thin and more easily disposed of.

When to Examine the Ears. Knowing how to do it understandingly, and having passed the stage when we are still looking at all the ears we can to become familiar with the manipulation, when should a physician feel called upon to examine the ears of a patient—

leaving out of consideration the very obvious cases when the patient complains of a pain in the ear.[1] I should say that it should be done, as a routine measure in children, daily, or at least frequently, in measles, whooping-cough, chickenpox, pneumonia, and acute bronchitis. In scarlet fever, and febrile conditions of obscure and not readily explained origin, the ears should be examined daily. In the scarlet fever cases, the rapidity of the destructive process and the serious effect on the hearing, with the great tendency to chronic suppuration and possible ultimate operation for its cure, demand that these cases be recognized and treated early, in the hope of obviating or ameliorating their serious consequences. A sudden rise of temperature in scarlet fever is often of otitic origin, and suppuration may occur without complaint on the part of the patient of pain in the ear.

In fevers of obscure origin, which the general practitioner has seen many more times than I, the riddle is often suddenly solved by the appearance of a discharge from the ear. How much more creditable it is to achieve the diagnosis than to have it thrust upon us.

In this connection attention has been frequently called to the manner in which acute middle-ear inflammation, especially in children, can simulate serious meningeal and gastro-intestinal disturbance. The reason is not hard to see, for the elevation of temperature causes the restlessness and cerebral and motor disturbances of the ear disorder to simulate more or less a meningeal irritation, especially when associated with pain in the head. In the other case, the disturbance is again through the medium of the temperature, which has suddenly and completely stopped gastric and intestinal secretion and the digestive processes dependent on them. Decomposition and fermentation are followed by auto-intoxication, which may so complicate the clinical picture that it looks like almost anything else rather than an acute otitis. In such a case routine methods only will save us from disaster.

What is Seen. Having cleansed the ear, and finally brought the the drum into view, we will see one of four things: (1) A normal drum, of uniform mother of pearl color; (2) a reddened drum, which may be more reddened in its upper part and along the handle of the malleus; (3) a red and bulging drum, which may vary from a slight fulness to a pronounced blister-like surface; or (4) a perforated drum, in which case pus or other secretion can usually be seen to exude from one spot on the drum, unless the drum is wholly or partially destroyed.

What to Do. Having determined to examine the ears, and having found some one of the conditions mentioned above, what must be done? If the ear drum is normal, nothing is to be done. J. F. McKernon, of New York, a few years ago spoke of the danger of mistaking a drum covered by a flake of epithelium, desquamated or ready to be desquamated, for a normal drum. Such a drum would have no lustre, and a little wiping will dislodge the dead tissue and disclose the true state of affairs.

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[1] This suggests the propriety of examining the ears of patients who are unconscious from any not easily recognized cause, since a hint may be obtained as to the presence of some infectious intracranial trouble of otitic origin.

If the drum is simply red, still not much is to be done in the way of active treatment; inspection of the nose and throat, renewed care of the skin and the secretions, protection from cold, and possibly inflation with the Politzer bag would be in order, and if any pain is complained of, a warm application to the ear is grateful. This may vary from a shawl or warm flannel pad to a hot water bag.

If the drum is red and bulging, we have then to deal with a fully developed otitis media with exudation. At this time we cannot tell whether the exudation is purulent or not, and I think we get in the habit of proceeding on the supposition, or at least the hope, that it is not. With this condition present there is more general disturbance, and, conversely, in seeking the cause of a considerable general disturbance, such as high temperature, cerebral irritation, etc., such an ear could be justly regarded as the cause of the symptoms, and the treatment would be governed to a considerable extent by the severity of the symptoms. If these are moderate in severity, with the fever not alarmingly high and not much complaint or evidence of pain, and no cerebral or gastro-intestinal irritation, then we may temporize. The nose and throat should be looked to, and such treatment applied to them as seems proper. But let me say that very often we can do very little in this direction, except a warm alkaline wash, either sprayed into the nose, or instilled from a teaspoon or medicine dropper. More active treatment is difficult to apply, and, on account of the traumatism attending its use, might do more harm than good. I refer especially to the application of astringents to the nose and nasopharynx. The bowels should be opened, preferably with calomel, the skin and kidneys seen to be properly functionating, and the child protected from exposure. To the ear we can apply heat in some convenient form. A hot brick, hot water bottle, electric lamp, hot salt bag, etc., suggest themselves as forms of dry heat, which had better be applied continuously. Moist heat is applied by flowing water from a fountain syringe into the ear. The technique must be carefully explained to the nurse. The bag should be hung or held a foot or two above the patient's ear, since there is nothing to wash out and all that is necessary is to get a flow of water into the ear. The water should be as hot as can be borne on the forearm, that is about 110° to 115° F., and at least two quarts should be used at a time. The tip of the nozzle or tube, of course, should not obstruct the meatus. Many of us recall Dr. Wm. Goodell's illustration of the washerwoman's fingers as illustrating the difference between the effects of short and long hot douching, and that point is to be applied here, as we want the constringing effect of the hot water. After finishing the douche, the ear should be dried and a warm or hot application made externally.

Drops are much used, and, undoubtedly, often relieve pain, and this is as far ahead as the lay woman looks. The most commonly used is a mixture of laudanum and olive oil. It is objected to as being dirty, but will probably continue to be used, and I cannot say that I have ever seen any ill effects from its use. I much prefer a warm 10 per cent. carbolized glycerin, which will do all that any solution will do, and is a protection from, rather than a cause of, infection in case of a rupture of the drum.

I have been often impressed with what strikes me as the happy effect of a single full dose of opium in this condition. I do not wish to be understood to say that children with earache are to be drugged into insensibility, but one full dose of opium often quiets symptoms, and during the lull the process subsides and is not the cause of further trouble. I am sure that the physiological action of opium is such as to make such a thing possible, if not likely.

It is well for our reputation as prophets that we should warn the parent, when the least bulging is present, that the drum may rupture and the ear discharge at any time; the alleviation of subjective symptoms gives no assurance that this will not occur.

If these measures fail to relieve the situation in twelve hours, or if the symptoms are of considerable severity when the condition of the ear is first discovered, I think we should not temporize, but at once incise the drum. While no surgical procedure is free from the possibility of unpleasant surprises, this one is practically so and fully justified by experience. The laity is accustomed to it now, but if one encounters an anxious mother who fears the effect on the hearing, she can be reminded that we only anticipate nature, and do no more harm than a spontaneous rupture would do. The drum should be incised freely in the posterior inferior quadrant, under antiseptic precautions and the best possible illumination. The drum is of the thickness of paper, and the knife need not enter deeply.

Local or general anesthesia may be used. Until one has gained confidence in the little operation, general anesthesia is preferable, as it is not always easy to tell which is drum and which is canal wall, and incision of the latter under local anesthesia is very painful. Under general anesthesia the two can be distinguished with a probe. Local anesthesia of the drum is very satisfactorily produced by means of a mixture of equal parts of cocain, menthol, and carbolic acid. These substances together form a liquid, which should be applied to the drum under good illumination, by means of a very small wisp of cotton on an applicator. I have often incised the drum by this method without the patient feeling it.

The incision, as a rule, is followed by a free discharge of serous fluid. It is well to keep a little sterile cotton in the canal and change it frequently, but not attempt anything in the way of cleansing unless the discharge becomes thick, when it may be removed by syringing with boric acid solution. If this is done, I think care should be used to dry the ear afterward with the cotton on an applicator. By packing of the canal with gauze following the incision of the drum, it is claimed that the discharge remains serous until it ceases, and that the mucopurulent character which it otherwise assumes is an evidence of infection. If this should prove to be so, then the canal should certainly be kept filled with the sterile gauze drain.

Attention should be especially directed to one phase of general disturbance which is of serious significance. With evidences of otitis media, there are sometimes seen sudden elevations of temperature to 104°, 105°, or 106°, with a sudden drop, and during the period of normal temperature the child is apparently perfectly well. The temperature will rise again after a few hours, or in a day or more. Dr. McKernon has called attention to this phenomenon as indicative of primary thrombosis of the jugular bulb, a serious condition, necessitating a serous operation.

If on the first examination a discharge is discovered coming from the ear, it should be treated as was suggested in speaking of the treatment of the ear after an incision of the drum. If symptoms arise indicating the presence of complications, such as mastoid pain and tenderness, irregular elevations of temperature with a sudden drop, or a persistence of the pains or temperature after the ear has begun to discharge, I think it is the duty of the general practitioner to have the opinion of an otologist.

The following brief notes of a few cases are suggestive:

Case I.—*Acute Otitis Media Causing Symptoms Resembling a Gastro-intestinal Disturbance.*

A little girl, aged nine months, and previously healthy, was taken sick with high temperature (103° to 104°) and constipation. In about twelve hours abdominal distention was noted, with tympany. The bowels were moved by an active cathartic, the discharges being very foul smelling. No diagnosis was made until the left ear began to discharge, when the temperature at once subsided and the abdominal symptoms rapidly disappeared. I did not see the child until the ear had begun to discharge, and the diagnosis was "thrust upon us."

Case II.—*Otitis Media Occurring in the Course of Acute Bronchitis and Causing Symptoms of Cerebral Irritation.*

I was asked to see infant G., aged six months, who had a mild acute bronchitis. The temperature had been about 100°, but suddenly rose to 102°, and the child became extremely restless, throwing the head back and tossing it from side to side. There was a demonstrable nuchal stiffness, the pupils were moderately dilated, and the eye grounds were normal. The left ear drum was found red and bulging, and paracentesis allowed the escape of a considerable quantity of serum, stained with blood at first from the incision of the drum. The temperature at once dropped to 99° and the child slept quietly nearly all night. The subsequent course of the otitis and the bronchitis was uneventful.

Case III.—*Otitis Media Complicating a Severe Bronchitis.*

The patient was a little girl, aged five years. She had a severe bronchitis with a temperature of 102 ° to 103°, but the physical signs in the chest and the temperature indicated subsidence of the bronchitis. Suddenly the temperature rose to 103° or 104°, with distinct complaint of pain all over the head. A bilateral otitis with bulging drums justified double paracentesis, which was done under local anesthesia with the cocaine-menthol-carbolic-acid mixture. A free discharge of serum, becoming later mucopurulent, occurred, with subsidence of the temperature. The child was unable to locate the pain as situated in the ears. There was later a further development of the bronchitis, with fresh exacerbation of temperature, explained by the physical signs in the chest and apparently not due to the ears. Drainage of the ears was sufficient and ultimate recovery perfect.

Case IV.—*High Temperature, Without Apparent Cause, Due to Otitis Media.*

This patient was an infant, who suddenly developed a temperature of 103°, without apparent cause. The restlessness was very marked, and in the course of a routine examination one ear was found inflamed, with a red and bulging drum. Paracentesis allowed a free serous discharge, with prompt relief of all the symptoms.

This case in my experience is a common type, and other similar ones could be quoted.

I well remember Dr. Agnew beginning his closing lecture at the University of Pennsylvania by saying that there were two operations every medical man should be able to do, tracheotomy and the operation for strangulated hernia. May I suggest the addition of paracentesis of the membrana tympani?

REVIEWS.

The Principles and Practice of Modern Surgery. By Roswell Park, M.D., Professor of Surgery in the University of Buffalo, Buffalo, New York. Pp. 1074. Philadelphia and New York: Lea Bros. & Co., 1907.

This excellent work is much more than a synopsis or condensation of the *Treatise on Surgery*, by American authors, which Dr. Park edited, and the material of which, since the exhaustion of the last edition, he has, with permission, freely used in the preparation of the present volume.

The scope of the book is as comprehensive as is that of most "Systems" and, in the main, this is justified by the admirable use the author makes of the space at his command. Surgical principles and surgical methods are quite adequately considered, and as to these portions of the book it may be said at once that they represent in a concise and readable form the best modern views. An excellent example may be found in the chapter on asepsis, antisepsis, and wound treatment, which should, however, be read in closer relation than it occupies in the book to the section on auto-infection. Both contain teachings of great practical value which, while not original with the author, are nowhere better presented. It might be desirable, however, to modify somewhat the statement that "the appearance of pus in a wound is a reflection upon the surgeon." It would be well if every operator had a surgical conscience that would lead to inner probings and tend toward self-reproach whenever suppuration occurred in a wound of his inflicting; the author says truly that the ideal aseptic technique will include many days of both local and constitutional supervision; but that by any method all the forms of auto-infection can be avoided in every case no one believes, and some of them may result in suppuration.

As to the forms of blood poisoning in which the poison has not had its origin in the wound, it is certainly true, as the author says elsewhere, that the surgeon is often not responsible, unless he has neglected to avail himself of certain precautions, namely, the preliminary elimination from the system—by diuretics, laxatives, and diet, aided often by massage strychnine, etc.—of all excess of waste products and intestinal toxins.

In the section on surgical diseases are considered the surgical fevers and other infections, including tuberculosis and syphilis. Some of the author's statements in regard to the latter disease might perhaps be modified with advantage. To say that in the tertiary stage of syphilis its transmission by inheritance and inoculation is "exceptional" is greatly to understate the enormous rarity of such transmission in the typical late tertiary period, if, indeed, in that stage, it ever occurs. In our opinion it does not. The remark that the physiological secretions, *e. g.*, saliva, milk, perspiration, tears, and urine "are not generally believed to be capable of transmitting the disease" is also much too mild. It is probable that no authentic and fully satisfying case of such transmission has ever been recorded. The statement that when the syphilitic father, by means of diseased spermatozoa, directly infects the ovum (without previously infecting the mother), "such infection is quite different from the infection of the ovum by the mother who has acquired the disease, the father having escaped it," might be misleading to students and seems, doubtless inadvertently, to suggest a distinction where there is really no difference. The *method* of infection, *i. e.*, the route of access of the poison to the ovum, may be different (though even that is uncertain), but the resulting infections are, of course, identical. The statement that when the epitrochlear lymph nodes are enlarged without evident and local cause "syphilis is always to be suspected or even diagnosticated" is much too strong, and if acted upon literally would work great injustice to many innocent persons. The importance of these nodes in the diagnosis of syphilis has always been greatly overestimated. Their characteristic enlargement, in the presence of other but doubtful symptoms, constitutes presumptive evidence of syphilis, as does the similar enlargement of the post-cervical chain, but beyond this in positiveness of assertion it is not safe to go.

In the treatment of gonorrhea, included in this section, there seems no reference to the internal administration of boric acid or salol, though in their practical value as urinary antiseptics these drugs are not equalled by the balsams here recommended. The statement that "alcoholic and sexual indulgences seem to materially lower the susceptibility" of individuals to gonorrhea seems opposed to ordinary experience. For "susceptibility" we should read "resistant power."

In dealing with stricture of the urethra too much latitude is inferentially allowed in the performance of internal urethrotomy; at least, no emphasis is placed upon the increase of danger as the membranous urethra is approached or when it is invaded.

A fairly careful survey of the book has led to the following scattered memoranda as to points of minor importance, some few of disapproval, which, however, serve by contrast only to emphasize the undoubted value of the work as a whole:

In the treatment of general furunculosis no mention is made of the internal administration of mercuric bichloride, of which the reviewer could say (as the author does of aromatic sulphuric acid) that "in the absence of recognized constitutional conditions" he has never found anything to equal it.

The opsonic treatment for furuncles and anthrax is perhaps too recent to have reached the "text-book" stage, but it is odd that no mention is made of Bier's treatment by hyperemia, even if it were thought unworthy of approval.

In considering neuropathic joint disease it is said that "the morbid changes within the joints comprise imaginary combinations of atrophy and hypertrophy." Such combinations are occasionally so real that it would seem as though the use of the word "imaginary" was probably a typographical error.

Is it not somewhat radical and, from the standpoint of possible malpractice suits somewhat unsafe, to say of fracture of the internal condyle of the humerus: "To dress such a fracture in the right-angle position is bad practice"? Stimson, for example, advises "rectangular flexion;" Scudder, "acute flexion;" Eisendrath, "splints to maintain the elbow-joint in a right-angled position." The *American Text-book* calls attention to the occasional tilting of the fragment even in full extension (the method employed by the author), to the possible impairment of the ultimate result, especially in the young, by the excessive formation of callus, and to the fact that satisfactory results can usually be obtained by treatment with a posterior rectangular splint; it inclines, moreover, to favor the acutely flexed position in the majority of fractures near the elbow-joint.

Twenty-one lines seem a very parsimonious allotment of space to fractures of the tibia, in consideration of their great frequency and practical importance.

The section on the abdomen and abdominal viscera, and that on the peritoneum, are among the most admirable in the book. The remark apropos of intra-abdominal disease, that "a careful blood count, especially a differential count, will often be of service, though it will occasionally mislead," while absolutely correct so far as the bare statement goes, seems to convey, on the one hand, too little appreciation of the frequent decisive character of the information obtained from a blood count, and, on the other, too great apprehension of being misled by it.

In speaking of the previous history of cases of suspected intestinal stricture it is said that "a history of typhoid, of dysentery, of tuberculosis, or of syphilis will be most suggestive," no attention being called to the fact that stricture after typhoid is almost unknown, but is relatively common after the other diseases, especially tuberculous ulceration. The anatomical explanation of this fact has reference to the circular arrangement and close approximation of the tuberculous ulcers (following the course of the intestinal vessels) as compared with the irregularly longitudinal distribution of Peyer's patches on the side of the intestine farthest removed from the mesentery.

In the directions for the preparation of a patient for a pancreatic operation, no mention is made of calcium chloride, though Robson and Cammidge say, without qualification, that the hemorrhagic tendency so fatal in many of these cases "can be successfully counteracted" by the administration of this drug. It would seem that it certainly should be used, and therefore alluded to, but it is doubtful if it is so truly a specific as they assert.

Of orchidectomy for hypertrophy of the prostate it is properly observed that "the method proved disappointing, although doubtless more or less effective in some cases, and so objectionable to many patients for obvious reasons that it has been practically abandoned."

The parasitic theory of malignant tumor formation is embraced by the author, with due caution, and his reasons for both the embrace and the caution are convincingly and interestingly set forth. Referring, however, to "inflammation" as meaning necessarily either "hyperemia, irritation, or infection," he says that he seems "to have completely ruled it out as by itself an active cause leading to tumor formation," yet in the same paragraph he says of irritation: "This has been acknowledged as a factor in the etiology of tumors, but as an uncertain one." There is no real contradiction here, but the argument would be clearer if at least the words "*by itself*" were italicized. The statement that malignant growths are "never encapsulated" (p. 293) would seem to conflict with the assertion that "sarcomas are sometimes encapsulated" (p. 273).

The author says that the parasitic theory of cancer lends plausibility to the statement which he wishes to emphasize, that cancer, like many of the other infectious diseases, is at first a local condition, that it is not transmitted by inheritance, and that there is a time in the history of every cancer when, if it could be recognized sufficiently early, and if it were also accessible and thoroughly removed, it could be cured. Theory apart, this is almost the most important lesson that could be taught to the general practitioners who are but slowly awakening to the fact that the "curability" of cancer depends more upon the *earliness* of operation than upon even its extent and thoroughness, important as they are. But why does the theory of infection support the view of the curability of cancer by early excision, and fail to apply to the abortion of syphilis by early excision of the chancre? Practically both statements—viz., that cancer is curable by thorough removal in some very early stage, and that nothing that can be done to the chancre has any effect in aborting syphilis—are probably true. But *theoretically*, if infection is to be invoked in the cancer cases it should equally apply to the syphilitic. The assertion that it is "an error" to suppose carcinoma to be a disease of middle and usually of advanced life is itself erroneous unless the error lies in the supposition that it is confined to those periods. The general truth of the idea is not invalidated by the occasional occurrence of cases at an earlier age. Indeed, the author immediately says: "To be sure, carcinoma is rare below the age of thirty."

To define hematomyelia as hemorrhage "within the central canal" of the cord, and hematorrhachis as "hemorrhage within the membranes or structure of the cord itself," is not in accord with present usage of those terms. They are often employed somewhat vaguely, but it would seem advisable, both etymologically and practically, to limit the former term to the lesions involving the central canal or the cord, and the latter to the extramedullary and extrameningeal lesions.

A very few typographical errors—("sated" should be "stated" on p. 896, "doing" "during" on p. 223, "wound" "would" on p. 948), an undue partiality for the split infinitive—"to so adjust," "to materially lower," etc.—an occasional inadvertence—"the use of rubber gloves is not ideal, but gives the nearest approach to it"—"*variate*" as a verb, "the lower portions of the spine are * * * more *protracted*"—may be mentioned, but rather as evidence that the reviewer has departed from the established custom of critics and has read the book, than from any importance of their own

Taken altogether it is one of the most readable, most comprehensive, most thoroughly modern, most practical, and most generally satisfactory of all recent additions to surgical literature. Nothing less was to be expected from Dr. Park, and no reasonable critic will be disappointed. He and the publishers are to be congratulated on the illustrations, the general make-up and appearance, and, above all, the contents of this admirable treatise, which, like all of Dr. Park's contributions to surgical literature, will be found to be an essential part of every working surgical library. J. W. W.

Physiology of the Nervous System. By J. P. Morat. Authorized English edition, translated and edited by H. W. Syers, M.A., M.D. (Cantab.). Pp. 680; 263 illustrations, 66 in color. Chicago: W. T. Keener & Co., 1906.

Prof. Morat's work on the *Physiology of the Nervous System* has been so well and favorably known for many years that we note with pleasure its translation into English. The translator, however, in his efforts to express shades of meaning has made this work difficult reading; it would have been far better had he expressed himself more clearly and in his own way.

In the first part of the work the elementary nervous functions are discussed. Under this head the author takes up the neurons, giving first the anatomical data and the functions. He subscribes to the views generally held and believes in the laws of Wallerian degeneration. He next takes up the effects of stimulation of the nerves, considering in detail the effects of different stimuli, especially electrical. The second part is devoted to elementary systematic functions, including the question of the relation of sensibility and movement, reflex acts considered in their broadest sense, consciousness and unconsciousness, and the functions of the different portions of the cerebrospinal system.

Prof. Morat's views of the relationship between sensation and motion are broad. He justifiably states that it is impossible to point out exactly where sensation ceases and motion commences, the passage from one to the other being general. All that can be said is that from the organs of the senses to the brain the development of the physical phenomena of sensation is progressive, while from the brain to the muscles it follows a retrograde course, ending by external movement. He subscribes to the views of Brissaud, who distinguishes between radicular metamarism and spinal or medullary metamarism. By the former is meant that which is evident by the anatomical arrangement of the nerve roots, and by the latter that which is based upon the fact that the segments of the spinal cord correspond to the implantation of the roots or myomers. He further says that radicular metamarism is genuine metamarism, while spinal metamarism in the process of development is reduced to a mere trace. In the discussion of the individual special functions of the roots of the spinal cord he believes that the same root is distributed to several muscles whose function is not univocal, and that conversely the same muscle receives the fibers of several roots. The practical application of this is that it explains why isolated paralysis of an anterior root causes only transitory disturbances of movement.

When discussing the probable functions of the different tracts of the spinal cord he accedes to the general views, but states that only part of Gowers' column goes to the superior vermis of the cerebellum. The views he adopts of the sympathetic system are those that are generally held by French authors. He takes little notice of the more recent opinions which have been so well expounded by English writers. He believes that the great sympathetic is a sort of spinal cord or a portion of the spinal cord disseminated in the nutritive apparatus whose functions it controls. He believes that the great sympathetic is formed by the intrarachidian or spinal part and by the extrarachidian or ganglionic division, united to each other by its ganglia. These form two wholes comparable to those which are found in the animal, one of which connects the brain to the cord and the other the cord to the periphery. Each of these wholes plays its part and has its special structure in both of these systems; but while the arrangement of the deep nerves of the two systems differs, that of the peripheral nerves is very similar.

His discussion of the functions of the cerebellum is very disappointing in the fact that it offers nothing new, being merely a *resume* of what is already known. He takes the view that in the posterior limb of the internal capsule the motor fibers are distinct from the sensory, a correct view, but one which is usually not so strongly held.

He does not subscribe to the opinion of extreme cortical localization, but believes that the motor area is really sensory-motor in function. He rightfully states that the expression "muscular sense" has been incorrectly used in that it has been made to designate all the deeper sensibilities which supply us with information concerning the execution of movement. He takes no cognizance of the work done by numerous American authors as to localization of this sense in the parietal cortex. There is nothing original in his discussion of visual innervation and ocular movements, and he still subscribes to the old view that an oculomotor area exists in the occipital lobes which is more or less interchangeable with the visual sensory area—an erronous view.

The book on the whole is good and is well balanced. The arguments used are excellent and based largely upon comparative knowledge. The strongest part of the book is that which is concerned with the broad principles of sensation and motion, while the special parts which are concerned with localization of function are only ordinary.

T. H. W.

THE STANDARD FAMILY PHYSICIAN; A PRACTICAL INTERNATIONAL ENCYCLOPEDIA OF MEDICINE AND HYGIENE, ESPECIALLY PREPARED FOR THE HOUSEHOLD. By PROFESSOR CARL REISSIG, M.C., of Hamburg, Germany; and SMITH ELY JELLIFFE, A.M., M.D., PH.D., of New York; with the Assistance of many American and German Specialists in the Treatment of Disease and Experts in Medicine and Surgery. In two volumes. New York and London: Funk & Wagnall Co., 1907.

IN the preface to this book, the editors refer to what they, perhaps properly, speak of as the long-felt want of a satisfactory work on medicine and hygiene put into such language that the intelligent layman can understand it and make satisfactory use of it. They rightly dwell upon the mistaken theories that are gathered from the ordinary "doctor-book" and the unreasoning interference that often develops from the very imperfect knowledge that is gained from such books, leading the layman to obstruct the work of the physician.

It is undoubtedly well that the laity and physicians should work in greater accord than has often been the case, and that the laity should have a clearer comprehension of what the physicians are attempting to do than is frequently given them. Likewise, it would, no doubt, be of great value to the public health, in general, if the laity had some knowledge of important hygienic principles. There is no question that most books that have been prepared with the intention of instructing the laity in points relating to hygiene and medicine have an evil effect: because they do give their readers the little knowledge that is so dangerous, and do not give them the knowledge that might be valuable, in a form in which they can intelligently use it. These books are, likewise, often absolutely incorrect in the statements that they contain.

The reviewer considers it quite possible to prepare a book for the laity that would give useful ideas on hygiene and would help them to lead their lives upon more rational lines. It is also possible, but much less easy, to prepare a book that will give the laity a few ideas in regard to illnesses that would suffice to give them some comprehension of the desirability of prompt action in some circumstances, to allay fears that have become traditional in reference to things that need not be feared, and to accomplish various such purposes. This, however, could scarcely be done in any way other than by thoughtfully preparing a series of what would be simple, practical, informal talks; not a systematic discussion of the science and art of medicine, which would be necessarily brief, confusing, and incomplete, but a discussion of individual things that are important to the layman, and in regard to which he needs to have only practical suggestions that will help him to avoid errors and dangers. At the same time, care should be taken that these talks do not introduce distorted ideas into his mind or give him a feeling of willingness to undertake responsibility in regard to illnesses, and, perhaps, quite as important as either of these, that they do not fill his mind with unnecessary fears and apprehensions. In the reviewer's opinion, a book of this kind that would be likely to do a great deal of good and little or no harm has not yet been written. In the absence of one of that character, his feeling is that works of this sort chiefly do harm.

The preliminary portion of the one at present under discussion, in which there is a description of the anatomy and physiology of the human body and of the causes of disease and its treatment—particularly the part relating to anatomy and physiology—is too technical to be clearly comprehended and made use of by a layman; and it is something that he actually does not need, in a technical form. At the same time, it would give many a person a mistaken sense of really having considerable knowledge of such matters, and thereby make him dangerous; because it is necessarily a very cursory discussion of these subjects. The remainder of the two volumes is an encyclopedic discussion, in alphabetical arrangement, of *all* the medical subjects that are considered to be of importance to the layman. Necessarily very brief, they are often in their very brevity, extremely confusing to the lay mind. They sometimes present very useful and important facts; they sometimes, to the reviewer's mind, give many facts that the laity ought not to be told at all, except by word of mouth when things can be made clearer. While, therefore, the work is planned with seriousness and earnestness and with excellent purpose, the end result is to present a book that is more honest than the usual "doctor-book," but one that contains much matter that will lead to confusion in the mind of the layman or actually give him distorted ideas.

Some of the statements in the book appear sufficiently harmful to make it really a dangerous thing to present to the public, in spite of many individual good things that it contains. For example, the description of the early stages of dementia precox, although sufficiently correct, would, in the form in which it is put, be extremely likely to make apprehensive young persons and their often still more apprehensive parents become unnecessarily terrified lest this unfortunate condition were developing, when nothing at all is the matter except that the child is a little lazy or a little overtired. Such things can certainly not be made comprehensible to the laity without direct conversation and explanation; and it is questionable whether they can be made comprehensible at all, beyond the fact that it is desirable, if any alterations in personal characteristics occur, to have a child examined and studied in order to learn whether there is any mental or physical reason for this that should be cared for. It is difficult enough for an alienist to determine the importance of early signs that suggest insanity; it would appear absolutely impossible to give the layman any book-description of the individual forms of insanity that would lead him to do anything but get into a state of confusion and probably of false terror.

Again, the description of the diet of a child in the second year of life is put in such a form that many a mother would suddenly transfer her infant, upon the beginning of the second year, to so much greater a variety and complexity of food as to do it serious harm. The reviewer has known exactly this thing to occur because physicians had given mothers directions as to the diet in the second year in a form not unlike that in which they are found in this book.

There are, likewise, a considerable number of instances in which the main point, that it would be advantageous for the laity to know about a disorder, appears to have been overlooked, with the result that the description of the disease is really harmful, rather than useful. For instance, in discussing abdominal colic, no emphasis is laid upon the possibility that severe or persistent attacks of "colic" may be due to appendicitis or similar dangerous conditions, or to the desirability of having this determined: there is merely a mild statement that it may be due to dangerous conditions, but no real insistence upon the need, if it is severe or persistent, of learning its exact nature in each case. There is on the contrary a discussion of treatment that would content the mind of many a layman and lead to dangerous delay. Under the heading appendicitis itself, there is no discussion that will soothe undue and exaggerated fears, or that will give any proper warning as to the danger of certain symptoms that the laity might well be taught to look upon as requiring prompt investigation and action; there is merely a technical description of the different forms of appendicitis which would hardly leave a picture in the layman's mind of what he sees or feels or should do. Under the head of sensations of numbness and tingling, it is stated without any further possibilities being considered, that these "are usually associated with grave nervous disorders; although in a number of rheumatic affections numbness and tingling in the fingers and toes may be met with." It is so common to meet with persons who are terrified by a little numbness and tingling due to relaxed vasomotors or similarly mild disorders, and it is so difficult often to convince them that they have no dreadful nervous or cardiac disease, that an incomplete statement such as the above would be likely to produce cruel distress with many who might read it.

These are fair examples of the sort of things that tend to make a book, with an honest purpose, likely to accomplish as much harm as good. D. L. E.

A TEXT-BOOK OF PRACTICAL THERAPEUTICS. By HOBART AMORY HARE, M.D., Professor of Therapeutics and Materia Medica in the Jefferson Medical College, Philadelphia. Twelfth edition; pp. 939; 114 engravings and 4 colored plates. Philadelphia and New York: Lea Brothers & Co., 1907.

A TEXT-BOOK OF PRACTICAL DIAGNOSIS. By HOBART AMORY HARE, M.D., Professor of Therapeutics and Materia Medica in the Jefferson Medical College, Philadelphia. Sixth edition; pp. 616; 203 engravings and 16 full-page plates. Philadelphia and New York: Lea Brothers & Co., 1907.

THESE companion volumes are issued again in new editions—the twelfth of the *Therapeutics*, and the sixth of the *Diagnosis*. The *Therapeutics* has been much revised: more complete information relating to materia medica has been given, and a considerable number of the recent advances in therapeutic procedure have been introduced, particularly the value of sodium citrate in the feeding of bottle-fed babies; the use of calcium lactate, hypodermically and by the mouth, in hemophilia, urticaria, and oozing hemorrhage; methods for the hypodermic treatment of syphilis; the importance of using saline solutions of exact strength for intravenous injections; the value of citric acid for preventing thrombosis in typhoid fever;

the danger of toxemia after the use of chloroform and ether; etc. Articles upon the treatment of the common diseases of the eye have been revised by Dr. G. E. de Schweinitz; those upon the treatment of disease of the puerperal period, by Dr. B. C. Hirst; and those on antisepsis, gonorrhœa, and syphilis, by Dr. Edward Martin.

The *Diagnosis* also has been thoroughly revised and enlarged. As is well known, the book differs in plan from that of most other books on the same subject. Major attention is concentrated on the clinical phenomena of disease as met at the bedside, the results of laboratory investigations being more or less minimized. The symptoms used in diagnosis are discussed first, and their application to determine the character of the disease follows. In other words, as the author states, the book is written upon the only plan that can be followed in practice, namely, the upbuilding of a diagnosis by grouping the symptoms. How well the author has succeeded in his purpose is amply attested by the popularity enjoyed by the book.

Indeed, of both books one may say that they have merited, as they have received, an unusual amount of professional confidence. In their new revised dress they are even more worthy than ever of this confidence, reflecting as they do to a noteworthy degree our present knowledge of the science and art of diagnosis and treatment. It is a pleasure to note that since the publication of the eleventh edition of the *Therapeutics*, the book has been translated into the Italian and the Chinese languages. A. K.

STÖHR'S HISTOLOGY, ARRANGED UPON AN EMBRYOLOGICAL BASIS. By FREDERIC T. LEWIS, M.D., Assistant Professor of Embryology in the Harvard Medical School. From the twelfth German edition by DR. PHILIPP STÖHR, Professor of Anatomy in the University of Würzburg. Sixth American edition. Pp. 434; 450 illustrations. Philadelphia: P. Blakiston's Son & Co., 1907.

THE new edition of Stöhr's *Histology* has been arranged upon an embryological basis by Dr. Lewis with the author's permission, though scarcely with his cordial approval, since in a prefatory note he disclaims responsibility for the translation, and asks his colleagues who question the correctness of any statement to convince themselves by comparison with the latest German edition that the paragraphs in question were written by him. The book, as it now is, is virtually a new book by Dr. Lewis, combining embryology and histology, clearly and concisely written, and thoroughly up to date. In order to have space for describing the controlling developmental features of the organs, and for presenting their adult structure somewhat fully, directions for preparing sections have been reduced to a minimum: this because Dr. Lewis believes that it is much more important that a physician should have a knowledge of the structure of the adult organs and the developmental possibilities of their constituent tissues that that he be familiar with the details of many staining methods—in which we quite agree with him. The nomenclature adopted throughout is that of the German Association of Anatomists. To those who approve of teaching histology upon an embryological basis, the book will appeal as one of the best if not the best; indeed little more need be said in commendation of the book than it has already gone through twelve editions in German and six in English. A. K.

PROSTATIC ENLARGEMENT. By CUTHBERT S. WALLACE, M.D., B.S. (Lond.), F.R.C.S. (Eng.), Surgeon to the East London Hospital for Children, and Surgeon to Out-patients, St. Thomas's Hospital, etc. BACTERIOLOGY by LEONARD S. DUDGEON M.R.C.P. (Lond.), Bacteriologist to St. Thomas's Hospital, etc. Pp. 215; 80 illustrations. London: Henry Frowde, Hodder & Stoughton, 1907.

THIS manual is the result, we are informed by the author in his preface, of investigations "undertaken to find a satisfactory solution of the success of the operation known as 'total prostatectomy.'" It is, therefore, based on original work, and certain portions will be gladly read by those who are interested in knowing the anatomical basis for their surgical treatment. Had the author been content to limit his treatise to these facts, the volume would not have suffered. He has, however, included a desultory description of the symptoms, diagnosis, and treatment, which is not sufficient for the knowledge of students, and which is superfluous to those who have other special treatises at their command.

The views which he advances are elaborations of those which have already been published over his name, and the correctness of which is very generally recognized. The points on which he insists most strongly in the introductory chapters are: (1) The bilobed nature of the prostate gland, and its development in the form of specialized urethral glands; and (2) that the fasciæ surrounding the prostate are not such distinct planes of connective tissue as they are usually described to be.

Two classes of enlargement of the prostate are recognized—encapsulated and diffuse. The former he regards as adenomatous in character, and probably truly neoplastic. He again insists, and there is little doubt that it is correct, that, in prostates whose enlargement is due to this form of growth, the capsule consists of a peripheral condensation of the prostatic stroma, produced by the overgrowth of the contained glandular acini, and that within the concentric layers of this capsule it is usually possible to detect glandular elements, which have not themselves been affected by the adenomatous change. The second (fibrous) class of prostatic enlargement, which he thinks is encountered in not more than 15 per cent. of patients, has no compressed stroma in the form of capsule, and enucleation is impossible. He acknowledges the existence of all grades between the two extreme forms of adenomatous and fibrous change; and he thinks it even possible that the adenomatous is a later stage of the fibrous enlargement. It may be remembered in this connection that Mr. Freyer has sometimes advised patients to postpone operative intervention until the enlargement shall have become still greater, and the prostate "shakes itself loose," as it were, from the surrounding tissues; because he has found by experience that enucleation will then be easier.

Mr. Wallace rejects the inflammatory theory of the production of prostatic enlargement, supported by Ciechanowski and others; he contends, and Mr. Dudgeon, in his bacteriological studies, takes the the same view, that the aggregations of round cells found in these organs are merely lymphatic in character, since similar groups of cells may be found in normal prostates and in those of children. Mr. Dudgeon believes that when bacteria are present in enlarged prostates the bacillary invasion is secondary to the enlargement, and in no way a contributory cause; and that, in particular, there is no evidence whatever of a gonorrhœal origin of prostatic enlargement.

Mr. Wallace prefers, and we think his preferences are founded on solid ground, to employ the suprapubic operation of enucleation, so widely popularized by Freyer, in all cases in which it is not contraindicated. For the fibrous prostates, which must be removed piecemeal, as a rule, he prefers the perineal route. He thinks it "very doubtful if the refinements, such as leaving the bladder, urethra, and vasa deferentia intact, can readily be carried out in the majority of cases" of the perineal operation.

The volume closes with a short chapter on carcinoma of the prostate. Among 64 enlarged prostates carefully examined microscopically at St. Thomas's Hospital, carcinoma was found in 8 cases. Wallace dwells on the possibility of distant metastases (*e. g.*, in the pleura) before the growth has extended locally beyond the limits of the prostate itself. He deems cystoscopic examination very useful in suspicious cases. He is open to conviction as to the benefits to be derived from Dr. Young's extensive perineal operations in these patients. At present he thinks the benefits have not been adequately demonstrated. A. P. C. A.

NOTHNAGEL'S PRACTICE: DISEASES OF THE INTESTINES AND PERITONEUM. By HERMANN NOTHNAGEL, M.D., Late Professor of Special Pathology and Therapy in the University of Vienna. Edited with additions by H. D. ROLLESTON, M.D., Physician to St. George's Hospital, London. Authorized translation from the German, under the editorial supervision of ALFRED STENGEL, M.D., Professor of Clinical Medicine in the University of Pennsylvania. Second edition; pp. 1059. Philadelphia and London: W. B. Saunders Co., 1907.

THAT a second edition of Nothnagel's *Diseases of the Intestines and Peritoneum* should be called for occasions no surprise: the excellence of the original and the care bestowed upon the English translation rendered such an event almost inevitable. Although the death of the distinguished author is lamentable, the book has fallen into excellent hands in the person of Dr. Rolleston, who with commendable industry and painstaking has made many additions throughout the text to make it conform to present-day knowledge. The volume is unquestionably the standard by which for some time to come the excellence and deficiencies of other books on the same subjects must be measured. A. K.

PRIMARY NURSING TECHNIQUE FOR FIRST-YEAR PUPIL NURSES. By ISABEL MCISAAC, formerly Superintendent of the Illinois Training School for Nurses. Pp. 197. New York: The Macmillan Company, 1907.

MISS MCISAAC has prepared a book designed to give the pupil nurse, at the beginning of her training, simple definite instruction in technique. The book contains detailed instructions for the proper carrying out of the many matters that make up the routine of the nurse's work, such as ward hygiene, making beds, giving baths, enemas, hypodermatic injections, etc., local applications, the observing and recording of clinical data, etc. There are also splendid suggestions for a series of clinical demonstrations—which should form part of the instruction of every junior nurse. Throughout the author is careful to insist that all subjects in the nurse's curriculum should be taught in their relation to nursing, and not to medical practice. The book is assuredly the equal of, if indeed it is not better than, other books on the same subject; unquestionably it should be the primer in all training schools for nurses.

A. K.

PROGRESS

OF

MEDICAL SCIENCE.

MEDICINE.

UNDER THE CHARGE OF
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Experimental Studies in Toxic Nephritis.—SCHLAYER and HEDINGER (*Deut. Arch. f. klin. Med.*, 1907, lxxxx, 1).—Much discussion still obtains as regards the clinical and anatomical classification of kidney lesions. While the conception of a tubular and a glomerular nephritis has become general, it must be admitted that innumerable intermediary grades occur, and we are hardly warranted in judging physiological activities by histological lesions. Thus, there is no guarantee that the glomeruli in tubular nephritis must have performed their normal functions because after death they show no lesion. Cohnheim was of the opinion that they are affected, but that the methods of investigation are too gross to discover the changes. Ribbert believes that glomerular involvement is the initial lesion in all acute nephritides, while Bernstein contends that parenchymatous changes are primary, and vascular and connective-tissue changes secondary. Clinical observations are inconclusive as indices of the anatomical changes, although Senator has drawn clinical pictures to correspond to the two pathological types. In their studies in experimental nephritis, Schlayer and Hedinger made observations upon the reactions of the renal vessels, the general blood pressure, and the diuresis. The activity of the renal vessels was obtained by measuring the volume of the kidney in an oncometer. The blood pressure was continuously taken and the diuresis measured by registering the drops of urine as they flowed from each ureter. After studying the reaction of normal kidneys to various stimuli, they applied the method to animals with toxic nephritis, and found that they were able to separate sharply two forms of functional reaction. In cases of chromate and sublimate poisoning, in which it is shown anatomically that the tubules are chiefly affected, it was observed that in the beginning, when there is already severe anatomical change, as indicated by large amounts of albumin in the urine, there is normal or even increased contractility and dilatability of the renal vessels, associated with polyuria and marked diuresis. In later stages and only after larger doses there is gradually developed a diminution in the dilatation response of the renal vessels and of the diuresis, while the contractility remains normal or becomes exaggerated. When there is extreme anatomical destruction of the tubules, with slight involvement of the glomeruli, dilatability and diuresis are completely lost, but contractibility, although diminished, is retained.

In the second group of cases, in which the glomeruli are definitely affected, as illustrated in cantharides and arsenic poisoning, the functional picture is quite different. Even after minimal doses and in a very short time after their administration there is a tremendous damage to the dilatability and contractibility of the vessels with the disappearance of diuresis. The clinical symptoms are much less marked than in the chromate cases; there is much less albumin and fewer casts, the only striking feature being the large number of erythrocytes. These alterations in the contractility of the vessels, Schlayer and Hedinger show, are definitely due to local changes, and the consquent loss of diuresis does not depend upon general blood-pressure changes. These two forms of nephritis, the tubular and the vascular, represent definite types to which the lesions produced by various poisons more or less closely conform. Changes from one form into the other do not occur, although combined forms are observed toward the end of the disease.

As further conclusions from their work, Schlayer and Hedinger point out that albumin is excreted by the tubular epithelium as well as by the glomeruli; that casts originate in the tubules; that there is a direct relation between the condition of the vessels and diuresis; and that diminished water excretion is due to a vascular lesion, even in the tubular type of nephritis. The general blood pressure in the vascular type shows from the first a gradual decline, which finally reaches minimal values. In the tubular type it is increased and remains high until the end. This would indicate that the poisons producing vascular lesions attack the centres as well as the peripheral vessels. Krehl points an analogy in human pathology. In corrosive sublimate poisoning there is increased blood pressure, while in diphtheritic and arsenical nephritis there is no increase.

Experimental Studies of Nephritic Œdema.—SCHLAYER (*Verhandl. d. Cong. f. innere Med., Wiesb.*, 1907, xxiv, 208), continuing the interesting researches reported in the preceding note, takes up the question of the origin of nephritic œdema. Does the cause of this œdema lie in the kidney, in extrarenal influences, or in a combination of the two? The only way to approach the question would appear to be by a comparison of the functional activity of the kidney in hydropic nephritis with similar conditions in which œdema is absent. The discovery of a poison (uranium) which produces in animals a nephritis associated with œdema has offered such an opportunity. Uranium nephritis, curiously enough, is associated with few anatomical changes in the glomeruli. The alterations are mainly epithelial. Richter and Georgopulos have shown that water as well as water-and-salt retention bring on the œdema. Heineke has demonstrated an hydropigenic substance in the serum of animals poisoned by uranium. But this interesting observation yet fails to settle the question as to whether the fundamental cause of the œdema lies in the condition of the kidney or depends upon extrarenal influences. Studying uranium nephritis by the methods described in his preceding article (see the preceding summary), Schlayer found that the behavior of the kidney toward stimuli of all sorts was exactly the same as that of the organ in chromic acid and sublimate nephritis. The variations in blood pressure follow the same rules; the anatomical picture is similar. In one respect, however, these cases of uranium nephritis differ strikingly from the tubular nephritides without œdema. According to the size of the dose, in from twenty-four to forty eight hours the contraction stimuli produce their normal effect. On intravenous injection of a few cubic millimeters of 5 per cent. salt solution the volume of the kidney increases rapidly with marked pulsation, just as in the normal kidney, *but the diuresis, which was previously normal, suddenly ceases instead of increasing.* On injection of caffein, the diuresis returns, but only to a moderate degree. In other words, on the injection of NaCl, instead of an increase in diuresis there occurs a sudden anuria at a time when the vessels show otherwise apparently normal functional activity. This occurs also in a somewhat diminished degree on intravenous injection of water with very small quantities of salt (0.3 per cent.), as well as with other saline diuretics. What is the cause of this remarkable condition? The anatomical changes differ in no way from those found in chromic acid and sublimate poisoning, while the vessels still show normal anatomical appearances as well as normal contractility and dilatability. One must apparently ascribe this anuria to a diminished permeability of the vascular apparatus of the kidney for which no anatomical or physiological cause is at the moment to be found.

After several days of anuria these anmials show œdema. The analogy between the functional conditions in these uranium kidneys and in the behavior of chronic nephritis in human beings, as observed by Strauss, Widal, Müller, Heineke, Pässler, and others, is striking. In both cases there is an insufficiency of the kidney following increased administration of salt and water, while, anatomically, the changes in the human kidney are closely similar to those in uranium nephritis. It would appear, then, that the determining cause of the insufficient elimination does not lie in the lesions of the tubular epithelium, but in the diminution or disappearance of the permeability of the vascular apparatus of the kidney, and that the apparent anatomical intactness of the glomeruli does not allow us to presuppose normal functional powers. But this diminished permeability of the renal vessels is not of itself sufficient to account for the œdema. The experimental introduction of large quantities of salt and water immediately after the period of onset of impaired permeability is not followed by œdema. Four or five days later, however, this begins to appear. One is led, therefore, to the probable conclusion that other changes in the cutaneous capillaries must first occur to render the onset of a general œdema possible. These observations then support the old Cohnheim-Lichtheim hypothesis as to the origin of œdema.

To summarize: These interesting observations appear to show that the hydropic uranium nephritis differs from the other non-hydropic tubular nephritides in that the renal vessels become impermeable much earlier to increased quantities of water and salt. But this retention is not alone sufficient to cause the development of œdema. Changes must first occur in the cutaneous capillaries. The retention of water and salt is essential for the development of œdema, for in animals fed upon a dry diet œdema does not occur. The author, in conclusion, emphasizes particularly the fact that his experiments show that "anatomically intact renal vessels may be wholly insufficient from a standpoint of excretion, while, moreover, a normal contractility and dilatability give no assurance of a normal secretion."

Note on a Danger in Urine Testing.—W. J. Rutherford (*Glasgow Med. Jour.*, 1907, lxviii, 196), while recently making routine examinations, was injured by the explosion of a test tube to which he was adding nitric acid while testing for the presence of albumin. On seeking the cause of this explosion he found that the test tube had previously been used in testing for blood with the guaiacum-blue reaction; to the sides of this tube a little of the precipitated guaiacum was still adherent. Rutherford found that the addition of tincture of guaiacum to strong nitric acid produced a very strong chemical reaction, while on pouring strong nitric acid into a little tincture of guaiacum the result is somewhat explosive and may be very dangerous, as in his own case. It must be noted, then, that guaiacum and strong nitric acid are incompatible, and too great care cannot be exercised in cleaning test tubes and the like which have contained tincture of guaiacum. The risk of an explosion is even greater if a trace of dry guaiacum resin remain.

The Early Diagnosis and Cure of the "Presuppurative Stage" of Amœbic Hepatitis.—Leonard Rogers (*Practitioner*, 1907, lxxviii, 776), through his residence in India, has had a large experience with hepatic manifestations due to infections with Amœba dysenteriæ. In a previous paper he had noted the diagnostic inportance of leukocytosis in acute hepatitis and the good results following the administration of large doses of ipecacuanha in the "presuppurative stage." His present article is based on some additional cases which he divides into the following groups: (1) Cases of acute hepatitis complicated with dysentery; (2) cases of acute hepatitis without dysentery and not treated with ipecacuanha; (3) cases of hepatitis without dysentery treated with ipecacuanha; (4) cases without dysentery or liver symptoms treated with ipecacuanha. In all of these groups except No. 2 the treatment with ipecacuanha in large doses rapidly yielded good results, and in the last group, in which there was fever, a leukocytosis and other vague symptoms which resisted various forms of treatment, these cases quickly responded to the ipecacuanha. In group 2 the patients either had a very protracted illness with gradual recovery or, if followed long enough, usually had a recurrence.

As regards leukocytosis the proportion of polynuclears is commonly comparatively little, if at all, increased. In 13 cases in which a differential leukocyte count was made, in none were as many as 90 per cent. polymorphonuclears present, while in only 3 were there over 80 per cent. Rogers has found this a point of diagnostic value in favor of this infection in contrast to other suppurative or acute inflammatory conditions. In about one-third of his cases an unsuccessful exploratory operation was undertaken before the disease was rapidly cured by the ipecacuanha treatment. He is, therefore, in favor of treating all cases with this drug first if there be any doubt as to whether suppuration has already taken place or not. In his pathological studies he found dysenteric ulcers in the colon in 18 per cent. of the cases examined, even in those cases with indefinite dysenteric symptoms or when these were entirely absent. According to reports from other sources when the dysenteries are of bacterial origin, ipecacuanha is useless in these conditions.

In conclusion Rogers regards ipecacuanha as invaluable in the treatment of amœbic dysentery, in fact as a specific; in those places where liver abscess is so common he regards this drug as second only in importance to quinine. The doses should be 20 to 40 grains once or twice a day, taken twenty minutes after a dose of tincture of opium. This, he says, in certain cases may abort a "presuppurative" amœbic hepatitis by curing a latent amœbic dysentery that produces it. In those cases without either dysentery or liver symptoms, yet with an intermittent fever and leukocytosis and other vague symptoms, its use is strongly urged by the author.

(This article is of interest on account of the strong conviction of the author as to the clinical value of ipecac in cases of suspected amœbic dysentery. It is difficult, from a pathological standpoint, to understand the term "presuppurative stages of amœbic hepatitis." It must be remembered that the pure amœbic abscess, so long as it remains free from infection, is always unassociated with suppuration.—W. S. T.)

Observations on the Effect of Prolonged and Severe Exertion on the Blood Pressure in Healthy Athletes.—G. A. GORDON (*Edinb. Med. Jour.*, 1907, xxii, 53) has had a unique opportunity of observing the effect of severe muscular exercise on blood pressure. The man was thirty-eight years of age and had arranged to swing Indian clubs for twelve hours continuously on six consecutive days. The weight of the clubs was three pounds. On examination before the test his arterial walls were found to be in a healthy condition; there was no sclerosis, the heart was very slightly hypertrophied, and the maximum systolic pressure was 105 mm. Hg. Observations were made with the Riva Rocci instrument and by Erlanger's sphygmomanometer. Two days before the test the maximum systolic pressure was 100, while the maximum diastolic pressure was 70 mm. Hg. At the end of the same day the maximum systolic pressure was 115 mm. Hg, the maximum diastolic pressure 80, showing a rise of 15 in the systolic and 10 mm. in the diastolic pressure. Readings were taken twice daily during the test and on every occasion in the evening a rise of blood pressure, once reaching as high as 15 mm. Hg, was found. The point of interest is the small difference that existed between the maximum systolic pressure and the maximum diastolic pressure. From the tables and tracings shown in the article it can be seen that every morning the pressure had returned to a normal of from 100 to 107 mm. Hg. The evening rise did not last long, as on the last day one hour after completion of the work it was only 100 mm. Hg. There was also very slight effect on the heart and pulse, the latter rarely varying from 84 both before or after the work. There was no irregularity of the heart and it showed no increase in size, either by percussion or by radiograms. Though the effect on the circulation was so slight, yet analysis of the urine showed the presence of albumin in that passed during and after the performance of the work, while in the morning specimens of urine none was found. Gordon has compared these results with those obtained in persons after a severe physical strain, in which case there was always a fall in pressure, more or less marked, and he concludes that: "Long-continued exercise of a more or less gentle character has a tendency to raise the blood pressure, while violent exercise, though perhaps causing first a primary rise, yet is followed later by a marked fall."

Absence and Marked Diminution of the HCl of the Gastric Contents in Cancer Involving Organs other than the Stomach.—Julius Freidenwald and L. J. Rosenthal (*New York Med. Jour.*, 1907, lxxxvi, 344) note that, while the absence of free HCl is an important diagnostic sign in gastric carcinoma it is likewise often absent in those cases in which carcinoma is present in organs remote from the stomach. The authors have carefully examined the gastric contents of 29 patients with various forms of cancer, and of these 9 showed a low total acidity with an entire absence of free HCl, 10 a low total acidity with a marked diminution in free HCl, and the remaining 10 a normal acidity with a normal percentage of free HCl. Thus, in 19, or 65 per cent., there was either an entire absence or diminution of free HCl. It is interesting that this absence or diminution persists after the removal of the cancerous mass. The authors say: "Whether the previous view that the condition is due to an alteration of the degree of alkalinity of the blood plasma is true or not, there can be no question that the phenomenon must be due to some general condition in the blood and that this condition still persists in the fluid even after the removal of the growth." This change in the HCl secretion may be of some value in the diagnosis of doubtful cases of cancer in organs other than the stomach.

Myxœdema.—Campbell P. Howard (*Jour. Amer. Med. Assoc.*, 1907, xlviii, 1226), in his careful study of this subject, first reviews the history of the disease, describes its clinical varieties, and gives a detailed report of 10 cases occurring in the service of Dr. Osler, at the Johns Hopkins Hospital. These, together with 92 other cases reported in American literature from 1881 to July, 1905, are then thoroughly analyzed. Among some of the interesting points brought out may be mentioned the following: Its comparative rarity among the negro race (about 1 per cent. of America); its greater frequency in northern or colder climates and also in females. As regards family antecedents and heredity there seems to be some psychopathic tendency in certain families. The question of consanguinity in the parents is most interesting, but more data on this point is needed. The marital state seems also to bear some relation to myxœdema. Howard thinks that the history of exophthalmic goitre preceding the onset of this disease would be more frequently elicited if more careful inquiry were made. He discusses the morbid anatomy, pathogenesis, symptomatology, and diagnosis of the disease. The history of thyroid therapy, of which Byrom Bramwell says: "It is no exaggeration to say that the cure of myxœdema by thyroid treatment is one of the greatest therapeutic achievements of this or any other age," is outlined, starting with the surgical work of Köcher, in 1883, on grafting of the thyroid and so on up through the various perfections of the idea by von Eiselberg, Victor Horsley, MacPherson, Murray, Howitz, Fox, and Mackenzie. The comparison of the results before and since the introduction of thyroid therapy is striking. Thus in those untreated, out of 19 patients 5 died (a mortality of 26.3 per cent.), 10 were unimproved, and 4 were said to be improved; whereas in those treated with thyroid therapy there were but 5 deaths out of 76 patients; 2 were unimproved, 9 improved, and 60 cured (79 per cent.). Death, in most of the 5 cases, could easily be ascribed to other uncontrollable factors, leaving the low mortality of 4.1 per cent. when compared with that previously of 26.3 per cent. in the untreated cases.

SURGERY.

UNDER THE CHARGE OF

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The Present Position of Spinal Anesthesia.—Strauss (*Deut. Ztschr. f. Chir.*, 1907, lxxxix, 275) has made an extensive study of this subject. Tropacocaine, he says, is the least dangerous anesthetic for spinal anesthesia, although it produces a series of disturbances and sequels, and may cause death. The dose of the anesthetic should rather be small than large; 0.006 gram of tropacocaine appears to be sufficient for all cases. By raising the pelvis and using a considerable quantity of a diluted solution, a higher analgesia is produced in the surest and least dangerous manner. The addition of adrenalin seems to act rather injuriously than favorably and should be avoided. Scrupulous care as to technique is necessary in order to avoid danger and error. The average duration of the anesthesia is about one hour. The anesthesia is with certainty limited to the lower extremities and the lower abdominal region. The disturbances from the injection and the later disturbances, through proper technique and selection of cases may be diminished but not entirely avoided. For the employment of spinal anesthesia there are very definite indications and contra-indications. It is indicated in all old decrepit patients in whom the narcosis cannot be produced in any other manner; in non-tuberculous lung diseases, and in diabetes. It is contra-indicated in the young up to fifteen years of age; in neuro- or psychopathic conditions; in diseases of the brain and spinal cord; in septic diseases; in all operations in which local anesthesia can be employed easily. Care must be observed in all tuberculous processes, in syphilis, in kidney diseases, and in all cases of advanced arteriosclerosis, especially of the brain. When it is employed in a proper manner and in suitable cases, spinal anesthesia offers definite advantages, although it is never without danger. The most efficient means of avoiding danger lies in definite restriction on the lines above indicated.

The Treatment of Acute Intussusception in Children.—Hausen (*Mitteil. a. d. Grenzgeb. d. Med. u. Chir.*, 1907, xviii, 129) says that 28 cases of intussusception in children were admitted to the surgical department of the Copenhagen General Hospital, from 1893 to the present. During the same time there was one case of chronic intussusception in a child and a few cases of the acute or chronic forms in adults. They emphasize, particularly, the great danger of conservative treatment, the non-operative or bloodless methods. Operative treatment without delay is the rule which is followed by Hausen at present. He says there can be no doubt of the diagnosis in the 28 cases. The cardinal symptoms were present in almost all. Great care, however, is necessary in the diagnosis of this condition, especially in the absence of a palpable tumor. In several cases of acute gastro-enteritis he was on the point of making the diagnosis of intussusception, but they recovered under dietetic treatment. It would be easy to make such a mistake and if conservative methods of treatment were followed, the credit might erroneously be given to this treatment for the cure of an invagination. Of the 28 cases, 14 recovered and 14 died. There were 17 of the ileocecal variety, 3 of the large, and 3 of the small intestine; 1 was probably an ileocecal and 3 were typical examples of a combination of an iliac and an ileocecal. In 1 case there was simultaneously an ileocecal descending and an ascending invagination of the large intestine.

The Treatment of Inflammatory Strictures of the Rectum.—Clairmont (*Archiv f. klin. Chir.*, 1907, lxxxiv, 180) says that the operative treatment for inflammatory strictures of the rectum should be first considered when conservative methods have failed or cannot be carried out. Every stricture that a small bougie will pass is dilatable, but the method is tedious and not without danger of perforation into the peritoneal cavity. The choice of operation usually lies between rectotomy, extirpation, and colostomy. Rectotomy is done in the Eiselberg clinic only when the stricture is just above the anus and is limited above. Incision of the sphincter is always avoided. Concerning the question as to whether the stricture should be extirpated or should be overcome by a colostomy, Clairmont says that he is in favor of a colostomy with gradual dilatation and irrigation of the affected portion of the bowel from the anus and the colostomy wound. While the method is laborious and tedious, often giving rise to pain and fever, it may be claimed that in the cases in which a colostomy is performed, gradual dilatation can bring about a complete cure and that this method is more effective than a colostomy alone. The colostomy should be placed as near as possible to the stricture on the oral side, as a rule in the region of the sigmoid flexure. The farther removal of the fistula from the stricture interferes with the first passage of the shot and thread through the stricture and its later dilatation. A lateral is always to be preferred to an axial colostomy In the first weeks after the colostomy has been performed, the rectum is to be irrigated with various solutions, as boric and silver nitrate solutions. At the same time in syphilitic cases, antisyphilitic remedies may be administered. For the dilatation Clairmont employs, exclusively, the conical sound, such as v. Eiselberg uses in œsophageal strictures. In order that the conical sound may be passed through the stricture, a silk ligature must first be passed. In some cases several days' efforts are necessary to succeed in doing this. The ligature, in some cases, may be conducted through the stricture by introducing it into the colostomy wound and carrying it through by injections of fluid. If this fails the fecal current may be tried, while the colostomy opening is closed by adhesive plaster, and castor oil administered to the patient. When this fails, also, a small œsophageal bougie may be passed, usually, from the natural anus, upward. If all these efforts fail, a preliminary posterior rectotomy must be done. For security two ligatures tied together should be passed, of which only one is employed for pulling the sound through. This should be smeared with oil or vaseline, and with a continuous gentle pull, drawn as far as possible through the stricture. It is permitted to remain about an hour, if possible. This is repeated daily. Not rarely the temperature rises from perirectal inflammation, which may lead to abscess. Only when the patient is able to pass moderate-sized sounds, and the secretion of pus and blood has disappeared, can the colostomy wound be closed.

A Prostatic Cancer Removed by the Operation of Freyer, and Some Remarks on the Frequency and Treatment of Cancerous Tumors of the Prostate.—Boddaert (*Jour. de chirurgie et annales de la Société Belge de Chirurgie*, 1907, vii, 371) reports a case of cancer of the prostate which he removed by Freyer's operation. This was done in the ordinary way, except that the rectum was distended by a Petersen's rectal bag which was left in place during the operation. This rendered the prostate prominent in the bladder and the introduction of the index finger into the rectum unnecessary. Boddaert collected from the literature 27 cases of cancer of the prostate operated on, which with his own made 28. Of these, 7 died a few days after the operation, 12 died in consequence of recurrence or cachexia, in from two to fourteen months after operation; five patients were lost sight of, and in 5 the operations were too recent to permit one to draw conclusions as to the operative results.

A Contribution to the Surgical Study of Tumors of the Head of the Pancreas.—Mauclaire (*Archiv. gén. de Chir.*, 1907, i, 1) reports a case in which he enucleated from the head of the pancreas opposite the internal border, a rounded, polylobed, noncsytic mass of rather firm consistency. There was relatively slight oozing. No glandular enlargement could be felt above the upper border of the pancreas. Cholecystostomy was also performed to relieve a somewhat dilated gall-bladder. From an operative standpoint the patient continued to do well, but he died two and one-half hours after the operation. Microscopic examination showed the mass to be an epithelioma. This was the seventh published case of partial pancreatectomy for a primitive, solid tumor of the head of the pancreas. This operation has been done four times for epithelial cancer, once for sarcoma, and eighteen times for benign tumors: cysts (sixteen cases), fibro-adenoma (one case), tuberculous lymphadenoma (one case). Secondary partial pancreatectomy in the course of ablation of a neighboring tumor, pyloric or colic, is much more numerous. In spite of the vascular and intestinal dangers, the head of the pancreas can be removed to a sufficiently wide extent. In malignant tumors, total removal of the head of the pancreas ought to be completed by a partial or total resection of the duodenum. Complementary operations may be necessary, *e. g.*, a grafting of the choledochus and duct of Wirsung into the duodenum or jejunum, or gastrojejunostomy, but these are complex and very difficult. The palliative operations, cholecystostomy, cholecystgastrostomy or enterostomy, etc., offer little encouragement. The diagnosis of tumors of the head of the pancreas is generally easy, because, unfortunately, they are usually cancers. The benign tumors are rare and difficult to distinguish from parapancreatic tumors. Early exploratory laparotomy will establish the exact diagnosis, and at times may be followed by a curative operation.

Treatment of Lowered Blood Pressure in Peritonitis with Intravenous Adrenalin-Saline Solution.—Hoddick (*Zentralbl. f. Chir.*, 1907, xxxiv, 1193) says that Kothe's recent publication on the influence of adrenalin extract in acute severe heart collapse has led him to report briefly on the experience of the Haidenhain clinic in the treatment of septic peritonitis with the intravenous infusion of saline solution with adrenalin. Their results have been more than satisfactory. Romberg and Pässler have shown experimentally that the disturbances of the circulation occurring in the height of acute infectious diseases are not due to primary influence on the heart, but to paralysis of the circulatory centres in the medulla. The lowered blood pressure is due chiefly to paralysis of the vasomotor centres. Hoddick has employed the saline infusions without adrenalin, but with no remarkable results. It was very different with injections of $\frac{3}{4}$ to 1 litre of physiological saline solution containing 6 to 8 drops of adrenalin. This was particularly true of severe cases of general peritonitis. Not all of the milder seropurulent cases were treated in this way; camphor, coffee, and subcutaneous injections of saline solutions being sufficient in these. From 1901 to 1904, inclusive, 20 cases of epityphlitic peritonitis were treated by the older methods, and of these 14 died. In 1905 and 1906, 16 cases were treated by the adrenalin method, and of these 3 died. In the operation Hoddick does not remove the pus by irrigation, but by sponging with dry gauze, as less damage is thus done to the peritoneum and the intestines are less disturbed. Gauze drains are employed, and these are removed in from five to eight days. The saline solution with adrenalin is employed if the pulse becomes small, weak, and frequent, with pale cyanotic face and sunken eyes. The effect of the infusion is surprising. The increase in blood pressure and general improvement are observed during the giving of the treatment. The solution is brought to a temperature of 41° C., and requires from twenty to thirty minutes to administer it.

The Pathological Physiology and Pathogeny of Intermittent Hydronephrosis.—Bazy (*Annales des maladies des organs genito-urniaires*, 1907, xxv, 1521) says that intermittent hydronephrosis has very distinct clinical and anatomo-pathological characteristics. From the standpoint of pathological anatomy there should be noted an abnormal disposition of the renal pelvis, of such a character that the urine is retained in the pelvis without the ureter participating in the retention. There may or may not exist a constriction of the ureteropelvic orifice. On the clinical side the chief phenomenon is a tumor in one or other renal region, coincident with a pain more or less acute and prolonged. The disappearance of the pain coincides with a polyuria often insignificant but also frequently very distinct or very intense, and followed sometimes by hematuria. This intermittent hydronephrosis is independent of movable kidney. Its cause appears to be an original malformation of the pelvis, so that the ureter opens at a more or less high level in the pelvis. There is produced a stagnation in the pelvis which develops into a hydronephrosis. It is, therefore, a congenital affection. The urinary retention is accompanied by an infiltration of urine into the neighboring region by transudation. This leads to an inflammation which is common to all cases of intermittent hydronephrosis, and which determines adhesions of the ureter to the pelvis. These adhesions transform an intermittent into a permanent hydronephrosis. This urinary transudation and œdema ought not to be confounded with passive congestion from circulatory disturbances.

Gunshot Wounds of the Peripheral Nerves and their Treatment.— HASHIMOTO and TOKUOKA (*Archiv für klin. Chir.*, 1907, lxxxiv, 354) state that the number of peripheral nerve injuries coming to treatment during the recent wars is much larger than in the earlier wars. In like manner the traumatic aneurisms are increased in number. These two conditions have become an important part of military surgery. In the Russo-Japanese war the writers treated 47 cases in which the nerve injuries involved the extremities, 27 being in the upper and 20 in the lower. The right radial nerve was most frequently involved. Nerve injuries require treatment more frequently than formerly, because in the earlier wars non-jacketed cartridges of larger caliber were employed and antisepsis was not in vogue. In consequence amputation was more common. In a certain percentage of the cases the lesions were the results of involvement of the nerves in developing cicatricial tissue. It is important that the injury be recognized in the beginning. Often this does not happen because the nerve injury is overlooked in the extensive involvement of the surrounding soft tissues and bones. One of the most constant symptoms is the neuralgia beginning immediately or a short time after the injury is received. Moist dressings may reduce this neuralgia, while their absence may render it almost unbearable. Motor disturbances usually show as a palsy, while disturbances of sensation appear in the form of hyperesthesia. Trophic disturbances are rather frequent, but are not observed until days or weeks have passed. The writers saw their cases usually after from fifty to three hundred days following the receipt of the injuries, because of their great distance from the scene of the fighting. This rendered it impossible often to determine whether the symptoms were due to the original injury to the nerve, to the cicatricial tissue surrounding the seat of injury, or to inactivity of the limb. The statements of the patients as to the original symptoms could not be relied on, because often shock or fear at the time of the injury influenced the judgment. Among their 50 operations, in only 7 did they observe total division of the nerve. In most of the cases there was only a partial injury of the nerve, with laceration or crushing of the neighboring soft tissues or bones. During the healing of these structures, the nerve trunk was caught in the developing cicatricial tissue or callus, and its functions were thus impaired. The injured portions of the nerves were sclerosed and thickened. The distal and proximal portions showed changes from 3 to 5 cm. from the wound. They were smooth, thin, and hyperemic. In more severe cases the peripheral portions of the nerves were considerably thinned, in some cases to such an extent that they could be followed only with difficulty. Disturbances of motion, sensation, and nutrition were usually observed in the region supplied by the nerve neighboring upon that injured. The writers saw the functions of the median nerve disturbed in a gunshot wound of the radial nerve, without any known cause other than the remote effect of the missile travelling through the tissues. Although it is very desirable that in appropriate wounds the primary suture should be employed at the front, it will generally not be possible to use sutures inside of five weeks from the occurrence of the injury.

A Revolver Ball Tolerated for Six Years. Rapid Death in two Days.—Remy (*Jour. de chir. et annales de la Société Belge de Chirurgie*, 1907, vii, 364) says that a young man was shot in the right temple six years before being seen. The wound of entrance at that time was disinfected, but no attempt was made to extract the ball, which was shown by the skiagraph to be divided into two parts. The smaller was arrested at a depth of 5 cm. against the falx cerebri, and the other was lodged at a depth of 3 cm. in the left temporal fossa. The intelligence and ability to work remained normal until April, 1906, and during this time there was no disturbance of motion or sensation. Then appeared his first attack of epilepsy. After that there were no more attacks until one year later, when a new attack of general epilepsy occurred. This was followed by one attack after the other without intermission. Remy counselled and performed an operation for its extraction, which consisted of making a trephine opening some centimeters in diameter. The part of the bullet removed was located under the cerebral cortex, at a depth of about 1 cm. The removal of the bullet was followed by the escape of a large quantity of turbid fluid, showing the existence of a large cystic pouch at least 7 to 8 cm. deep. On account of the shocked condition of the patient, the effort to remove the second part of the bullet was given up. The patient regained consciousness, but died five hours after the operation.

When a projectile penetrates the cranium there exists for a time a period in which there is danger of infection of the track of the bullet, by shreds of skin, hair, etc. It seems that the longer the time elapsing from the date of the wound, the less the danger. There is, however, no absolute security, as the period of tranquillity may end abruptly at any time. Nimier has cited a tolerance of thirty-two years, but in this case the bullet was encrusted in the bone substance. While it touched and irritated the membranes, it had not perforated them. Remy collected 11 cases in which the missile had lodged in the brain; among these the period of tolerance varied from some months to eighteen years. The greater number ended by a fatal complication due to the presence of the projectile. Peraire's case was cured by operation. The symptoms which terminate the period of tolerance, may be divided into three varieties. In the first may be placed those in which the symptoms come on slowly and may be relieved. In the second they also come on slowly, but are beyond the resources of the physician. The third class are the more frequent. The symptoms come on suddenly and are of short duration. There is not enough time for operation. Abscesses or cysts open into the ventricles or the meningeal cavities, and cause a meningo-encephalitis or a generalized meningitis. In the future Remy expects fully to explain to the patient the dangers of the period of tolerance, and to propose operation if the localization is favorable.

THERAPEUTICS.

UNDER THE CHARGE OF
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The Treatment of Obesity.—LORAND (*Journal de médecine de Paris*, 1907, xix, 319) states that the best treatment for this condition is prevention. Foods rich in calories should be avoided; to replace these the green vegetables, fresh and cooked fruits, and such carbohydrates as oats, which have small caloric value, should be given. The dietetic treatment is aided by the administration of such waters as Hunyadi, Apenta, etc., and by water cures such as those of Carlsbad and Marienbad. Here the employment of baths augments the favorable effect of the waters. In the treatment of the form of obesity which is not due to over-eating, the administration of the thyroid gland is most likely to prove effectual. The urine should first be examined for glucose. The fresh gland is the preferable preparation; the doses should be small and should be continued for a considerable period. The heart should be watched and if the pulse rate reaches 90 to 100 the treatment should be stopped. In the case of obese women ovarian opotherapy is indicated in connection with the administration of the thyroid gland.

Arsenic in the Treatment of Syphilis.—PLATEAU (*Revue de thérapeutique*, 1907, lxxiv, 13, 458) finds that arsenic possesses a decided antisyphilitic action. In a patient treated by him by the usual methods the papular syphilide was most resistant, but immediately upon the administration of hypodermic injections of sodium cacodylate this symptom began to disappear. Upon resumption of mercurial treatment a recurrence was at once noted; this cleared up under further injections of the sodium cacodylate. Along with the betterment in the cutaneous manifestations the patient's general condition and appetite began to improve. It seems probable that there are patients who resist mercurial treatment and in whom benefit may be achieved by the administration of arsenic, which in large doses appears to have a direct antisyphilitic action. The cacodylates are particularly suitable under these conditions because they may be given in large doses with less danger of causing toxic symptoms than is the case with arsenic in other forms.

Sodium Anilarsenate in Syphilis.—Hallopeau (*Journal de médecine de Paris*, xix, 24, 229) employs the following treatment: The beginning dose of the anilarsenate is, in the ordinary patient, 11 grains given hypodermatically. Two such injections are given, to be followed after a two days' interval by two more. Then a series of four injections of $7\frac{1}{2}$ grains each at intervals of three days is undertaken. These amounts suffice to maintain an active quantity of the drug in the organism. If toxic symptoms, such as gastric disturbance, abdominal pain, general malaise etc., are noted, the treatment should be stopped until these disappear. In addition to the hypodermatic administration of the agent local lesions may be dressed by means of compresses wet in a solution of the anilarsenate or with an ointment containing this substance. In gummas or localized tertiary syphilides the injection of the drug in the neighborhood of the lesion is advised. There is no incompatibility between sodium anilarsenate and mercury or potassium iodide; the three agents may be employed simultaneously if desired.

The Treatment of Hemoptysis.—According to Reiche (*Münch. med. Woch.*, 1907, xxi, 1059) the three essentials in the treatment of pulmonary hemorrhage are: (*a*) to put the patient wholly at rest; (*b*) to influence the pulmonary circulation so that coagulation shall be favored; (*c*) to cause the blood to clot as rapidly as possible. The first two points may be attained by insisting upon bodily and mental quiet and by the application of cold and the administration of morphine. Adrenalin, lead acetate, tannic acid, iron perchloride, ergot, and amyl nitrite have given but poor results in the author's experience and the employment of gelatin in order to hasten the coagulation of the blood was not encouraging, but calcium chloride in doses of 45 to 60 grains daily has an active influence in this regard. It is possible that this salt may be the active element of gelatin. With the calcium chloride, digitalis, morphine, etc., may be associated if indicated.

The Harmlessness of Large Doses of Strychnine.—Troisfontaines (*Reveue de médecine*, 1907, xxvii, 532) states that strychnine may be employed in much larger doses than are usually given without producing toxic symptoms. In instances in which heavy stimulation is indicated he does not hesitate to administer from $\frac{1}{12}$ to $\frac{1}{6}$ grain hypodermatically of strychnine sulphate or nitrate and to repeat this dosage up to a total amount of $\frac{3}{10}$ grain or, more rarely, $\frac{6}{10}$ grain in twenty-four hours. Following such doses he has never seen untoward effects. The various pathological conditions in which strychnine may be employed are numerous: diabetes mellitus and insipidus, certain paralyses, sunstroke, psoriasis, pulmonary tuberculosis, surgical shock, acute and chronic alcoholism, and in states of collapse and of nervous depression such as occur in infectious disease. In the last type of patients injections of strychnine even up to a daily amount of $\frac{3}{10}$ to $\frac{1}{2}$ grain repeated for from four to eight days may be given without anticipating toxic symptoms. In fixing the dosage the patient's weight and the condition of the liver and kidneys should be taken into account. The drug has no cumulative effect.

Pyroligneous Acid in Arthritis Deformans.—Rosenthal (*Monthly Cyclopædia of Practical Medicine*, 1907, x, 299) recommends this agent as affording relief from the pain and stiffness of this obstinate affection. Under its administration the redness of the joints disappears, the swelling diminishes, the rigidity of the joints and tendons is relieved, and the mobility returns to a greater or less degree; the fibrous ankylosis relaxes or can be broken up. Whenever the lesions are not hopelessly advanced they can be made to disappear and normal function is restored to the joint. After the use of the acid the joints can be forcibly moved and, though fibrous tearing may be felt by the patient, he complains but little of the pain and the reactionary hyperemia does not appear or is slight and evanescent. The restoration of function is well shown in the use of the hands and fingers. The claw-like posture, the position of extension, and the constant effort to protect the member are no longer seen, flexion and extension return, and the hand resumes its duties. The author cites 6 patients in whom benefit has followed the exhibition of pyroligneous acid. The usual dosage is 2 teapoonsfuls thrice daily.

The Advantages of Digalen Over Other Digitalis Preparations.—Friedlander (*Therap. Monats.*, 1907, iv, 173) states concerning this preparation, which is a soluble form of digitoxin, that it possesses the following good points: (1) Its taste is somewhat bitter, but is aromatic and not disagreeable. (2) Its strength is apparently constant. (3) It is convenient to handle, the patient being able to keep it with him in a small bottle, from which the dose is taken in drops. (4) It is not disturbing to the digestion. (5) It may be administered by means of intravenous or intramuscular injections, but not hypodermatically on account of the resulting pain and inflammation. (6) Its action is quick, becoming evident in about fifteen minutes after intravenous or intramuscular injection, and in from four to twelve hours after oral administration. (7) The dosage is constant, the strength of the preparation being always the same. (8) Cumulative action appears to be very rare.

The Treatment of Arteriosclerosis.—Senator (*Folia Therap.*, 1907, i, 37) states that in this affection the proteids should, as far as possible, be withdrawn from the diet. Meat and very rich foods are best altogether excluded. The regimen should consist chiefly of carbohydrates and fats—the so-called lacto-vegetarian diet, the allowable foods being bread, farninaceous foods, gruels, fats, and green vegetables. Eggs may be allowed in small quantity. Meat should be omitted or taken only in small amount, and of the watery kinds poor in albumin—the so-called white meats. Fresh fish may be eaten. In obese patients the sugars and starches should be diminished, but green vegetables and fruit are desirable and lean meat may be allowed. The bowels should be kept open and exercise should be taken. In diabetes the albuminous foods should be less restricted, but the carbohydrates must be limited, for in most of these patients the reduction of sugar excretion is the leading indication for treatment. Recent investigations tend to show that by diet regulation the viscosity of the blood is lessened and thus the onward movement of the blood is promoted and the work of the heart and bloodvessels is lightened. Iodine also has an influence in diminishing the viscosity of the blood and also may exert a favorable action upon the arterial coats. The influence of the iodine preparations may be augmented by combination with the arterial dilators. Senator is accustomed to prescribe a mixture consisting of potassium or sodium iodide $\frac{1}{2}$ to 2 drams and sodium nitrite 15 to 30 grains dissolved with 2 ounces of water. Of this 20 to 30 drops is taken three or four times daily. Glyceryl nitrate is also often prescribed. Hydrotherapeutic measures, especially carbon dioxide gas baths, and active or passive exercises may be employed in suitable instances. With regard to the use of the artificial blood salts given in the proportion in which they occur in normal blood, on the principle that these are diminished in arteriosclerosis, Senator states that he is not prepared to give an opinion as to their specific action, for he has employed them only in connection with other forms of treatment. The preparations of these salts consist of sodium chloride, sodium sulphate, sodium phosphate, sodium carbonate, magnesium phosphate, and calcium glycerophosphate. When administered with due regard to digestive conditions and in proper amounts, they are well borne.

The Treatment of Acne Vulgaris.—MARTIAL (*Gaz. méd. de Paris*, 1907, xiii, 4) states that in the treatment of this affection we should (*a*) modify the seborrhœic condition of the skin and (*b*) combat the eruption itself. The first of these considerations may be treated by lotions of water as hot as can be borne, of 3 per cent. sodium bicarbonate solution, or of 1 per cent. resorcinol or salicylic acid in alcohol. These should be applied preferably in the morning, toilet soap being avoided in so far as it is possible. During the day an ointment consisting of 15 parts of vaselin, 10 parts of lanolin, and 30 parts of lime-water should be employed, and at night one consisting of vaselin 25 parts, zinc oxide and starch, of each 12 parts, salicylic acid 1 part, and resorcinol 0.5 part should be rubbed in. Constitutional and digestive disorders should receive appropriate treatment.

Hematuria due to Small Doses of Hexamethylenamine.—BEARDSLEY (*Penn. Med. Jour.*, 1907, ix, 691) reports three instances in which hematuria developed very soon after the first dose of the drug was given, and in none of which more than 30 grains had been administered. The hematuria in these patients was discovered by the routine examination of the urine, and in the first two instances the drug was stopped at once, with the result that the hematuria also ceased. In the third patient the blood was thought to be due to the fact that circumcision had been lately performed and, the drug being continued, decided symptoms of strangury and bladder irritation appeared, with a large amount of blood in the urine; these symptoms were relieved as soon as the hexamethylenamine was stopped.

Nucleinic Acid Injections in the Induction of Hyperleukocytosis.—DIEZ and CAMPORA (*La quinzaine thérap.*, 1907, viii, 95) have performed a series of experiments upon guinea-pigs, based upon the principle that nucleinic acid injections are capable of increasing the number of leukocytes in the circulating blood. In one series of experiments upon twenty-four of the animals they found that intraperitoneal and subcutaneous injections of the acid caused first a brief hypoleukocytosis, followed by hyperleukocytosis lasting about seventy-two hours. In a second series they found that the evolution of peritonitis due to intestinal perforation was distinctly delayed in guinea-pigs which had previously (six, twelve, eighteen, and twenty-four hours) been subjected to nucleinic acid injections. From these and other experiments it is concluded that injections of the acid should be useful in abdominal operation in human beings to augment the resistance of the peritoneum, as well as in intestinal or gastric perforation.

PEDIATRICS.

UNDER THE CHARGE OF

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OF PHILADELPHIA.

The Acetonemic Conditions of Children.—F. LANGMEAD (*Brit. Med. Jour.*, 1907, ii, 819) divides patients, in whose urine diacetic acid and acetone are detected by ordinary methods of examination, into 3 groups: (1) Those who usually show no symptoms of acidosis. Included among these are cases of excessive fat ingestion, starvation, gastric ulcer, malignant disease, and many others, perhaps all due to deprivation of carbohydrates. (2) Those who, while suffering with other morbid states, have also symptoms of acid poisoning, such as those suffering from diabetes, gastro-intestinal disturbance, epidemic diarrhœa, sepsis, peritonitis, and certain forms of poisoning, as morphine, phloridzin, etc. (3) Patients suffering from uncomplicated acidosis, which may terminate fatally. These are the subjects of delayed anesthetic poisoning and of recurrent, cyclical, or periodic vomiting, conditions known as cryptogenic acidosis. The symptoms of acidosis include dulness, drowsiness, or even coma; in some cases restlessness, delirium, and convulsions; flushed face, dry and rough tongue and lips, and great thirst; the breath has the odor of acetone and the urine contains acetone, diacetic acid, and sometimes β-oxybutyric acid. In grave cases there is persistent vomiting, rapid wasting, slight icterus, and hyperpyrexia. Langmead reports 3 cases in which the symptoms were due to previous anesthesia; in 2 chloroform was the anesthetic, in 1 nitrous oxide; the last patient recovered. He also reports 3 cases of acidosis in the course of recurrent vomiting. In all 5 of his fatal cases the autopsy revealed a very fat, buff-colored liver; fatty degeneration was present also in other organs, but not to the same extent. He considers the cause of acetonemia to be failure of fat oxidation. His conclusions are: Acetone and diacetic acid are found in the urine in a number of conditions, and may be, but are not necessarily, associated with symptoms of acidosis. Cyclic vomiting and delayed anesthetic poisoning are examples of acidosis of unknown origin. Delayed anesthetic poisoning is due not so much to the kind of anesthetic used as to the state of anesthesia. The acetone series is a product of the imperfect oxidation of fats, and hence, in these conditions the oxidizing power of the tissues must be inadequate. This is further demonstrated by the condition of the liver. There is evidence in favor of the failure of oxidation being due to too great a supply of fat to the chief seats of oxidation rather than to a primary deficiency in oxidizing power, although the latter alternative cannot be excluded. Probably this may be brought about by a variety of toxins which act like phosphorus. The determining cause of acidosis is the accumulation of the precursors of acetone, either from excessive formation or deficient excretion. Anesthetics are dangerous to patients who are the subjects of acidosis. He advises the following routine measures to prevent a possible acetonemia: give alkalies in all cases before the operation if the patient is subject to acidosis, and particularly if he has bilious attacks; also if the urine contains acetone; use ether in preference to chloroform in such cases. When acid poisoning is present a purgative should be given at once and the stomach washed out; bicarbonate of sodium solution should be given intravenously, and lactate of sodium by mouth; if the patient can be fed by mouth, no fats should be given.

Tricocephaliasis.—Up to ten years ago the trichocephalus was considered a harmless parasite of the large intestine, but since then a number of grave and even fatal cases have been reported; it may be as dangerous as Anchylostomum duodenale, Bothriocephalus latus, and Trichina spiralis. In certain portions of Switzerland it occurs in 25 per cent. of the people. The eggs are usually swallowed with water or by eating earth; each infected individual forms a source of danger for his surroundings. The symptoms produced depend on the number of parasites in the host, the time of infection, the size of the parasites, and the general health of the patient. Concerning the manner in which the worm produces the symptoms associated with its presence there are differences of opinion; some say that it sucks blood directly from the bloodvessels of the intestinal mucosa, others that it produces a toxin, which acts as a hemolytic agent. No matter how produced, it is true that anemia is probably the most prominent symptom. R. KAHANE (*Corres. f. Schweiz-Aerzte*, 1907, xxxvii, 235) reports the case of a girl aged four and a half years, who had been suffering with diarrhœa since childhood, but the stools contained no tubercle bacilli a year prior. The patient at that time was markedly anemic and a hemic murmur could be made out. Until the child was old enough to be taken into the field she was well, and only developed the anemic state after she began to eat earth, which she was very fond of; an older brother had the same habit, and was also very anemic. The examination of the heart showed marked enlargement and a loud systolic murmur; hemoglobin estimation 15 per cent. The stool contained large numbers of the ova of Trichocephalus dispar and blood. Thymol by the mouth and by enema brought away twenty specimens of the parasite and numerous ova; slight improvement resulted. Numerous worms continued to come away with the enemas, but in spite of this the patient became worse; albumin and sugar appeared in the urine, the face and ankles became edematous, and petechiæ appeared in a number of places, and death ensued. The autopsy showed the heart to be enlarged, the muscle soft and flabby; the valves were not diseased. The liver was enlarged, fatty, and typically nutmeg. Both kidneys were diseased. The small intestine was contracted; the large intestine, but especially the cecum, markedly dilated; uncountable parasites were found throughout the large intestine, partly buried in the mucosa, and partly swimming loose in the contents of the bowel. The appendix contained ova and worms, and was in a state of chronic inflammation; clinically the patient frequently had had attacks of colic referable to the right iliac fossa.

A New Operation for Penile Hypospadias.—R. T. H. BUCKNALL (*Lancet*, 1907, ii, 887) describes a new operation for the relief of penile hypospadias, which has proved very successful in his hands. Three patients were operated on and cured. The advantages which he claims for the operation are as follows: It is performed in two stages, each of which is rapidly accomplished. This lessens shock and enables the operation being done at an early age, the ultimate result being all the better for it. The skin utilized for the roof and floor of the new urethra is not dissected up or even touched; consequently, it retains its vitality and does not tend to slough. No sutures project into the lumen of the new urethra. The skin of the roof and floor of the new urethra is in continuity with the skin of the roof and floor of the previously existing one. This avoids the possibility of a fistula or stricture at the site of the false meatus. No buried sutures are necessary, and the apposition of the broad, raw surfaces of the flaps on either side prevents leakage. The disadvantages are that it is applicable only if the scrotum is uncleft; hair may grow later from the skin of the scrotal raphe which forms the floor of the new urethra. The former objection is minimized by the small number of cases not penile. The raphe grows very few hairs; if the operation is done early, the epithelium may change its characteristic and not develop hairs; if hairs do grow they are not necessarily troublesome.

Notes on Certain Fatal Forms of Pharyngeal Diphtheria.—A. HARRIS (*Lancet*, 1907, ii, 896) states that there are forms of diphtheria in which a fatal ending can with certainty be predicted. The symptoms presented by these cases are as follows: (1) A grayish color of the face, which in addition presents an anxious expression. (2) Vomiting independent of food and not accompanied by nausea; it presents a similarity to cerebral vomiting; the vomitus is yellow or green. (3) Abdominal pain referred to the umbilicus, without abdominal tenderness. (4) Albuminuria, usually a large amount, but no tubecasts. (5) Suppression of urine is the rule in these cases. (6) Alteration in the rhythm of the heart sounds. This appears after the vomiting has set in. The alteration is usually the gallop rhythm. The patients are generally very restless, and consciousness is maintained to the end.

The membrane of the throat in these cases is dark colored and the smell of the breath is most offensive. Antitoxin has not the slightest effect in these cases, although 6000 units were given in each instance. Six cases are reported. Large numbers of streptococci and staphylococci were associated with the diphtheria organisms in the swabs from these throats. Harris does not believe that they were the cause of the fatal termination, but suggests the possibility that there are different kinds of diphtheria bacilli, which elaborate different toxins, and which may be neutralized only by special antitoxins.

Arthropathy in Rötheln.—D. A. ALEXANDER (*Lancet*, 1907, ii, 921) reports the following remarkable case: The patient, a male, developed, after a few days of sore throat, stiff neck, malaise, and moderate fever, a rash having the distribution and appearance of German measles and accompanied by an enlargement of superficial glands, notably those of the neck. Before the exanthem had faded the patient began to complain of stiffness and tenderness in the knees and ankles, and soon all the interphalangeal joints of the fingers presented the spindle-like swelling commonly seen in rheumatoid arthritis. There was no exacerbation of temperature and neither cardiac nor other complication. A fortnight from the appearance of the rash all the symptoms were subsiding, and in the six months which have elapsed only an occasional transient stiffness in the fingers reminds the patient of the attack.

OBSTETRICS.

UNDER THE CHARGE OF

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Deciduoma Malignum.—TRILLAT and VILLOT (*Jour. l'obst.*, March, 1907) conclude a paper upon this subject as follows: The epithelial elements of different sources which form chorio-epithelioma take origin in epithelium, and exclusively in the villi of the chorion. Neither the stroma nor the decidua shares in this process. The recognition of this condition enables one positively to identify a typical or an atypical case.

Between the typical and atypical cases it is impossible always to make a clear distinction. Especially is this seen in cases in the early stages of pregnancy in which the typical arrangement of the different elements of the tumor seems to have been destroyed. In these cases the process does not always go on to the formation of a pronounced tumor, but infiltrates more or less deeply the uterine tissues with isolated ectodermal cells which take origin from the chorial cells in the decidual basement membrane. This is often found in hydatid mole or in the early stages of placental development.

Chorio-epithelioma always develops after pregnancy, abortion, or molar pregnancy. Its point of origin is first within the uterus at the border of the zone of placental insertion in normal pregnancy, or where the placental tissue begins to form in the tube in ectopic pregnancy. We sometimes find cases of chorio-epithelioma outside the zone of placental insertion. This is explained by the transference through the circulation of debris from the villi of the chorion which develop at the border of this zone or give place to a primitive chorio-epithelioma. Such a tumor has a biology of its own with a tendency to spread and to destroy surrounding tissue, with an absence of bloodvessels and lymphatic formation. Clinically the disease shows itself by severe hemorrhage and increase in the size of the uterus, with the phenomena of metastatic infection in the early stages. In some cases hemorrhage in the substance of the tumor occurs through ulceration of its peritoneal surface. The spontaneous cure of chorio-epithelioma has been observed. Bilateral degeneration of the ovaries, usually cystic in character, has also been found coincident with hydatid mole or chorio-epithelioma. The recent studies of Bonnet lead us to consider chorio-epithelioma as derived by a histolytic process from the fœtal ectoblast, from the very first stages of the development of the ovum up to the point of its nidation. One must admit that the formation of chorio-epithelioma seems to be an attempt at a normal physiological process whose character is altered by some agency yet to be determined.

Abdominal Section for Irreducible Retroversion and Retroflexion of the Pregnant Uterus.—Küstner (*Monats. f. Geburts. und Gynäk.*, 1907, Band xxv, Heft 2) reports the case of a multipara admitted to the clinic with pronounced ischuria. The uterus was pregnant and retroflexed, and efforts to replace it failed. The patient had previously been under treatment, when it was found that the uterus was fixed by adhesions. Accordingly abdominal section was performed.

The uterus was between the fourth and fifth month; the anterior wall extended above the smaller pelvis; very abundant but thin and fibrous adhesions were found preventing the replacement of the uterus, and extending between the posterior wall, tubes, and ovaries, the peritoneum about the rectum, and posterior wall of the pelvis. These adhesions were broken up by the fingers, and some of them, which were especially firm, with the Paquelin cautery. The adhesions extended deeply in the posterior cul-de-sac to the posterior aspect of the cervix, the wall of the vagina, and the surrounding peritoneal tissue. After severing the adhesions the uterus was readily replaced. After the operation a pessary was worn and a catheter allowed to remain in the bladder for eight days. The patient's pregnancy was uninterrupted, and the pessary was removed when the uterus had ascended into the abdomen. Küstner calls attention to the fact that no other method of treatment could have been successful in this case.

Ruptured Ectopic Gestation with Free Hemorrhage into the Abdominal Cavity.—Haim and Lederer (*Monats. f. Geburts. und Gynäk.*, 1907, Band xxv, Heft 2) conclude a paper upon this subject, and report briefly 27 cases. These came to operation, 23 of them recovering and 4 dying. The mortality stated by others under this condition was 14.4 per cent., 24.6 per cent., 20.3 per cent., but the present series of cases gives a mortality of 14.8 per cent. One of these patients died from acute anemia four hours after section. In another patient the diagnosis was obscure, and curetting was first done. Two days afterward section was performed and the fœtal sac extirpated. The patient had high fever until her death. Autopsy showed a purulent endometritis, thrombophlebitis, and peritonitis.

The third case had pronounced bronchial symptoms and subnormal temperature. Autopsy showed pulmonary tuberculosis and purulent peritontis.

In another case during abdominal section the bladder, which was drawn up upon the anterior abdominal wall, was wounded. Fever occurred, with death after a week. Autopsy showed peritonitis and degeneration of the heart muscle.

As regards the convalescence of the 23 patients who recovered, severe complications were remarkable for their absence. In 1 patient cystitis developed fourteen days after operation, which prolonged the convalescence. Another patient had, a week after operation, considerable hemorrhage from the vagina which did not seem to affect the healing of the tissues.

As regards temperature, 8 patients had no elevation after operation; in 7 the temperature was subnormal; in 8 cases high fever was present during the first days. In most of these chills occurred at intervals for four days. These transient fevers, which did not affect the healing of the wound, seemed to be from intoxication produced by the absorption of extravasated blood within the abdominal cavity. In some patients hemoglobinuria accompanied these phenomena. The essential process seemed to have been hematolysis. The length of convalescence was on the average twenty-six days. Other operators give the average time of recovery as thirty-six and forty-six days.

Among the complications observed were thrombosis, pleuro-pneumonia, hemorrhagic infarcts, exudate in the stump, and bleeding from the stump. Some of these occurred in 14 cases. The shortest convalescence was fifteen days, the longest fifty-nine days. In 8 patients convalescence was shorter than twenty days; in 9 less than thirty; in 3 under forty; while in 2 it was not complete in fifty days.

As regards the permanent results of operation for ectopic gestation, it was possible to trace most of the cases operated upon. In 22 patients information concerning their subsequent health was obtained in 14; of these, 11 were completely well and free from all disturbances; 2 of these had ventral hernia. Among the 16 cases coming later under observation ventral hernia was observed in 4, and was thought to have been caused by the use of the tampon at the time of operation. One patient developed severe cystitis and hernia during convalescence.

If the permanent results of these operations be compared with those of other surgical procedures in 47 abdominal sections, 11 had permanent complications after recovery and 2 had ventral hernia.

It is estimated that 67 per cent. of patients after abdominal section become perfectly able to do active work. In contrast to this are the statistics of Seidl and Uthmöller, who found respectively that in 96 and in 80.9 per cent. the patients were able to do their accustomed work after abdominal section.

As regards subsequent conception in these cases, the tendency to the repetition of the complication is well known. Sufficient time has scarcely elapsed since some of these operations to enable one to judge, as in 16 cases 2 patients have passed through normal labor since the operation, 2 had uterine abortion, and 1 had advanced three months in pregnancy.

GYNECOLOGY.

UNDER THE CHARGE OF

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Fibroma of the Ovary fixed in the Pelvis, Causing Complete Extrusion of the Uterus.—DAUBER (*Brit. Gyn. Jour.*, 1907, pt. lxxxix, suppl. to vol. xxii, 9) reports the case of a woman of seventy-seven years upon whom he operated successfully.

Sarcoma of the Parovarium.—SPANTON (*Brit. Gyn. Jour.*, 1907, xxii, 31) reports a case occuring in a woman, aged forty-two years, who had been married sixteen years and had two children born alive and one miscarriage twelve years ago. Her general health had been good and she never had any illness until five years ago, since when neuritis of the limbs and head appeared. The catamenia appeared regularly every three weeks up to two years ago, but since she had had only four or five periods. Believing herself pregnant, as she had noticed an enlargement of the abdomen for a year, she had three months ago consulted her physician, who examined her and found she had a fluctuating, cystic growth. To the right of the uterus a hard mass could be felt, movable like the base of a multilocular ovarian cyst. The uterus was normal. Upon operation a thin-walled parovarian cyst, containing two gallons of clear, straw-colored fluid, was found. At its base was a solid growth springing from the outer extremity of the left Fallopian tube. The growth was removed, the base ligated, and the ovary left behind. The tumor was found to be extensively infiltrated with spindle-celled sarcomatous growth, probably of endothelial origin. It has a capsule of fasciculated fibrous tissue, and the periphery is more or less alveolated by strands of unabsorbed stroma. Toward the centre there are more alveoli and less stroma. No ovarian tissue can be detected. Spanton thinks the interest in the specimen lies in the sarcomatous infiltration occurring in a simple cyst, having all the characteristics of a rapidly growing parovarian cyst, and the extreme thinness of the cyst wall.

Rupture of an Ovarian Cyst During Pregnancy Causing Grave Internal Hemorrhage.—MORESTIN (*Ann. de gyn. et d'obst.*, October, 1907, 602) reports a case in a woman of thirty-five years, who was four months pregnant and brought into a hospital in profound acute anemia from internal hemorrhage. A rapid operation was done, and abortion occurred two days later. Much bloody fluid was removed from the peritoneal cavity. The wall of the removed cyst, which was ruptured, was markedly infiltrated with blood. The appearance of the tumor resembled that due to twisted pedicle, and Morestin believes this condition caused the hemorrhage and rupture. The history of the case supports the belief, pregnancy being one of the chief causes of such torsion. The recovery was tedious.

Uniting a Double Uterus.—Strassmann (*Zentralbl. f. Gynäk.*, 1907, xxxi, 1322) states that in a case previously reported and in two new cases reported in this article a septum dividing the uterus into two cavities was removed. The first patient operated upon later gave birth to a live child. The result in the first of the new cases was considered satisfactory five months after the operation. In the second of the new cases the operation was undertaken primarily for a tumor of the adnexa. The patient died seven days after the operation from ileus. The last case reported was one in which the uterus was divided to the cervix. The operation was undertaken solely for the purpose of correcting this condition. The patient gave a history of eight pregnancies terminating in from three to eight months. The fetus in each pregnancy was in the left uterus, which was larger than the right. The uteri were brought down through an opening in the vesico-vaginal pouch and sections from the inner side of each removed. The uteri were then sewed together, replaced, and sutured to the bladder. The septum in the cervix and one in the vagina were divided. An examination three months after the operation showed that good results had been obtained. The author considers that an operation for a non-functionating bifid or septate uterus is as justifiable as one for cleft palate.

Carcinoma of the Ovary Involving the Sigmoid Flexure.—Bowerman Jessett (*Brit. Gyn. Jour.*, 1907, pt. lxxxix, suppl. to vol. xxii, 41) reports a case of this kind that occurred in a subject forty-eight years of age who had had four children. The menopause had occurred six years previously. At the first examination Jessett had found a small tumor that he considered a fibroid in the posterior wall of the uterus. Fifteen months later the tumor extended from Douglas' pouch nearly to the umbilicus and was somewhat fixed. With the diagnosis of rapidly growing myoma Jessett operated. The growth was found firmly attached to intestines and omentum and particularly to the sigmoid. It proved to be ovarian, and resection of the sigmoid proved essential. Both ovaries were removed and found infiltrated by alveolar carcinoma, but at different stages. The larger was solid and rather soft, was seen to be very cellular, and growing actively. The growth had become atypical, the aggregated masses of epithelium showing in parts a tendency to mucoid degeneration, the fibrous stroma, which was ill developed, being infiltrated by a large number of inflammatory cells. The smaller growth was less advanced and more atypical. The arrangement of ovarian tissue was more easily traceable and less tendency to degeneration was noted.

The Diagnostic Value of Koch's old Tuberculin in Gynecology.—Pankow (*Zentrlbl. f. Gynäk.*, 1907, xxxi, 1257). The diagnostic value of the tuberculin was studied in 32 cases. In 24 of the cases the tuberculin reaction coincided with the anatomical and histological evidence. There was no tuberculosis in 23 cases, yet in 3 of these the tuberculin reaction was positive. Tuberculin was present in 9 cases, 5 of which failed to show the local reaction to tuberculin, although all 9 showed the general reaction as indicated by chills, fever, vomiting, etc. The results are therefore, rather unfavorable to the contention of Birnbaum that in tuberculosis of the genito-urinary organs the injection of tuberculin gives rise to localized symptoms such as pain, establishing the nature of the disease. The main conclusion drawn by the author is negative in character, and is to the effect that the absence of both general and local symptoms following tuberculin injections practically excludes tuberculosis of the female genito-urinary organs.

Abdominal Colpopexy for Prolapsus Uteri.—Jacobs (*Brit. Gyn. Jour.*, 1907, lxxxix, suppl. to vol. xxii, 76–81) describes this new operation as follows: Abdominal section, the incision reaching to the pubes. The uterus is strongly drawn upward to stretch the vaginal walls, and is freed from its ligamentary attachment to the right and left by severing the broad ligaments outside the appendages. The ovarian vessels are secured and the round ligaments severed, the incision continuing to the uterine arteries at the level of the cervix, where they are clamped and divided. The uterosacral ligaments are next divided. The uterus and appendages are now lifted out of the abdomen. The bladder and peritoneum is then pushed away from the anterior vaginal wall as far as possible. The posterior vaginal wall is freed from the peritoneum and the rectum as far as practicable. The uterus is severed from the vagina, taking with it a V-shaped portion of the latter anteriorly and posteriorly. Anterior and posterior colporrhaphies are done from above, the knots of the sutures, which are placed from below upward and tied as soon as placed, being left on the vaginal side. The severed end of the vagina is closed. The broad ligaments are next covered with peritoneum, being whipstitched. The next step is placing two silk sutures through the round and uterosacral ligaments and the upper end of the vagina. The abdomen is closed. Jacobs did 77 operations from 1894 to January, 1907, on patients between the ages of forty-three years and seventy-one years, with 1 death that was due to gastric complications of a specific origin. There have been but 3 recurrences, and these slight in character.

Sarcomatous Cyst of the Ovary in an Hermaphrodite having a Masculine Appearance.—Chauvel (*Ann. de gyn. et d'obst.*, October, 1907, 605) reports a case of this character occurring in a child of fifteen years, in which he performed laparotomy, removing the tumor, death occurring in five and a half months from manifest return of the disease. The child was cryptorchid. It appeared to be a case of hypospadias in a male child otherwise normal. Even the voice seemed but natural for a boy of fifteen years. The presence of a tumor the size of a large fist was noted in the right iliac fossa and the abdomen was distended by fluid. Upon laparotomy being made, a large amount of dark blood poured out, revealing a large cystic tumor of the right ovary. It contained a thin fluid. The Fallopian tube was plainly visible, as was the left ovary and tube. No uterus could be found, and the pelvis had a masculine shape. Six months later the patient died from a similar development, probably in the left ovary. The tumor removed proved upon microscopical examination to be a sarcomatous cyst of a very malignant type. It had developed rapidly and with monthly attacks of local peritonitis. The blood found in the peritoneal cavity was found to be due to a partial rupture in the end of the tumor near the stomach. The presence of the tubes and ovaries caused the parents great consternation.

OPHTHALMOLOGY.

UNDER THE CHARGE OF

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Practical Experience with Serum-therapy in Ulcus Serpens.—MAYWEG (*Archiv f. Augenheil.*, August, 1907, p. 417) reports of 23 cases of ulcus serpens, the pneumococcus was found alone in 22, the diplobacillus in 1. Passive immunization only was employed. The results were excellent in 8, even as to sight; good in 7; in 3 relapse followed decided improvement (the treatment was intermitted too soon); in 4 cases no direct improvement, but even in these the final result was less unsatisfactory than was to be expected from previous methods of treatment alone. The best results are obtained if the serum be employed at the earliest possible moment (10 c.c. in the beginning, three times daily) and continued until healing is complete. The time of treatment is much shorter compared with other methods (fourteen days on the average as against four to five weeks), the restoration a more complete one, cicatrices more transparent, and sight better. The complications following operative treatment do not occur.

Treatment of Myopia.—SATTLER (*Archiv f. Augenheil.*, May, 1907, p. 187) maintains the following: (1) Myopia may be prevented from increasing by full correction through the maintenance of an adequate distance for near work and prevention of excessive depression of the visual plane. (2) In youthful subjects the full correction cannot rarely be borne in myopia of 10 D. and higher. (3) If the myopia should nevertheless progress, the increase is as a rule but slight. (4) In high degrees of myopia also it is necessary to maintain the working distance through a suitable correction at 20 to 25 cm. at least. (5) A timely accurate correction seems to protect the myopic eye from the special dangers threatening it. (6) Insufficiency of convergence is, as a rule, satisfactorily relieved by full correction. (7) If muscular asthenopia persists when a sufficient degree of exophoria is present, the setting back of one or both external recti is necessary, or in default of this a suitable prismatic combination. (8) In the highest degrees of myopia (18 D. and upward) in young subjects until about 40, extraction of the lens is to be recommended. (9) Primary extraction is superior to Fukala's method of primary discission for the following reasons: smaller number of operations, earlier result, less danger of loss of vitreous, prevention of increased tension and its consequences, and finally, as it seems lessened, danger of postoperative retinal detachment.

Blindness in Portugal.—Meyer (*Archiv f. Augenheil.*, May, 1907, p. 195) reports that a recent census in Portugal gives 6222 blind and 6320 having but a single eye among the 5,166,841 inhabitants of that country, giving 12 blind in 10,000. The true number is no doubt greater. Of 2000 instances the causes were as follows: congenitally blind, 9.1 per cent.; traumatisms, 8.6 per cent. (mostly from blasts in quarries); smallpox, 7 per cent. The percentage of trauma responsible for the loss of one eye was also very high; 40 per cent. were due to blasts. The remaining most important causes, as gathered from inmates of institutions, were tabes, meningitis, trachoma 3.2 per cent., blennorrhœa (gonorrhœal), myopia, glaucoma 35.17 per cent. Trachoma is endemic in many parts of Portugal, so that 12 per cent. of the patients of the Ophthalmic Institute of Lisbon suffer from this disease. The percentage from glaucoma, 35.17 per cent., is so high for the reason that almost all cases come for treatment when it is too late. Instruction in diseases of the eye is very inadequate (there is but one chair of diseases of the eye in the entire kingdom). The lists showed that about 50 per cent. of the entire number were preventable.

Airol.—Fischer (*Centralb. f. prak. Augenh.*, August, 1907, p. 229) resumes his report upon this agent published in the December number, 1896, of the same journal, emphasizing the most important property of this remedy, namely, its extremely favorable action in the severest forms of corneal ulceration. The powder is dusted into the eye four times daily after preliminary cocainization. In cases of severe ulcus serpens which continued to progress even after the use of the galvanocautery, the insufflations frequently obviated the necessity of a further application of the cautery or even of the Saemisch operation.

In three cases of gonorrheal conjunctivitis in children in which half of the cornea was in a state of suppuration with threatening perforation, and even when the latter had already occurred, the insufflations, of course without a bandage, were successful in preserving the cornea; strange to say, neither the swelling nor the secretion were influenced.

Pathological Hippus.—Aurand and Breuil (*Archiv. d'Ophtalmol.*, February, 1907, p. 74) come to the following conclusions upon this subject: (1) The term pathological hippus is used to designate variations in the diameter of the pupil which seem not to depend solely upon ordinary physiological causes, and which are characterized by movements abnormal in frequency or character. It is therefore not always simple exaggeration of a physiological phenomenon. (2) It seems necessary to distinguish several varieties of pathological hippus, according to the following categories: (*a*) Hippus from hyperexcitability of the nervous centres; this variety is a kind of ataxia of the pupil and the only one which can be considered as resulting from exaggeration of the physiological phenomenon. (*b*) Respiratory hippus; this form accompanies the movements of respiration, producing through their effect upon the circulation an inspiratory mydriasis and expiratory myosis. (*c*) Hippus accompanying paralysis of the third nerve in process of convalescence; this is a sort of nystagmus of the pupil, the mechanism of which is the same as that of the nystagmic movements of the extrinsic muscles when these are called into function. (*d*) Rhythmic hippus; this special form seems to be due to a kind of autonomous action of the peripheral centres of the iris. These centres are habitually under the influence of numerous other centres which govern them; the former under certain conditions of isolation suffice to bring about the abnormal movements of the pupil. The latter conclusion is supported by a case reported *in extenso.*

PATHOLOGY AND BACTERIOLOGY.

UNDER THE CHARGE OF
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Physiological and Pharmacological Studies of Magnesium Salts.—The work of Meltzer and his co-workers have shown that the magnesium salts have remarkable action in producing nervous inhibition and anesthesia when injected subcutaneously, intravenously, or when introduced into the spinal canal. In order to study the method of elimination from the body of these salts, MELTZER and LUCUS (*Jour. Exper. Med.*, 1907, ix, 298) have conducted a series of experiments to determine the influence of nephrectomy upon the toxicity of magnesium salts. From these experiments it is concluded that magnesium salts, when introduced subcutaneously, are eliminated to a great extent through the kidneys. After nephrectomy in rabbits the susceptibility to the magnesium salts is increased by about 50 per cent.; so they concluded that the kidneys apparently eliminate about 50 per cent. of the injected salts. It was found that an injection of magnesium sulphate was more toxic immediately after nephrectomy had been performed than when it was introduced eighteen or more hours after the operation. This is probably due to the development of vicarious paths sufficient for elimination of a fraction of the salts. The cumulative effect of magnesium salts in nephrectomized rabbits was very striking. The effect of several subminimum doses was equal to the effect produced by the sum of these doses given at a single injection, while in rabbits in which nephrectomy had not been performed the effect was not cumulative because apparently the salts are eliminated by the kidneys.

The Pathogenesis of Gallstones.—Kramer. (*Jour. Exp. Med.*, 1907 ix, 319) points out that the present theories of gallstone formation do not explain the process by which cholesterin and calcium salts, which are normally soluble in bile, are precipitated in cholelithiasis. In order to determine whether bacteria played a part in this precipitation, typhoid and colon bacilli and staphylococci were grown in a carefully filtered mixture of equal parts of bile and alkaline peptone solution. All of the organisms grow well in this medium. The staphylococci did not produce any change in the reaction of the medium, nor did any precipitation occur. With both varieties of bacilli, however, the medium became cloudy and in about four weeks a very well-marked, closely packed, semisolid mass was seen at the bottom of the tubes. The constituents of gallstones were found microscopically in this sediment. The bile seems to have a markedly preservative action on the typhoid and colon bacilli, thus showing a parallel to the fact that these bacilli remain alive a long time in gallstones. Kramer believes that these experiments indicate very clearly that gallstone formation is due to chemical decomposition of the bile, the direct result of the growth of microörganisms therein. He considers it a process similar to the formation of phosphatic urinary stones.

The Muscular Connection between the Auricle and the Ventricle (His' Bundle) in Normal Hearts and in Adams-Stokes Disease.—Fahr (*Virch. Arch.*, 1907, clxxxviii, 562) has studied the heart in three cases of Adams-Stokes disease with particular reference to the condition of the bundle of His. In the first case the bundle was longer than it is in normal hearts, and since the sections did not include the terminal portions, no definite conclusions could be drawn as to its complete integrity. In the second case a gumma was found in the ventricular septum which extended to the annulus fibrosus. In this region the fibers of the bundle, as they emerged from the annulus fibrosus, were completely destroyed by the syphilitic infiltration. In the third case a fibrous scar was found at the point at which the bundle divides. The scar tissue involved the left branch, but at this point the right branch was not involved. The fibers of the bundle running to the right ventricle however, were, destroyed by a fibrous thickening at the point at which they enter the musculature of the right ventricle. Fahr, from a study of normal hearts, reached much the same conclusion as to the structure and course of this bundle of muscle fibers as did Tawara. He could not, however, show that the termination of the fibers in man was the same as Tawara has described in the sheep. In the sheep it can be readily demonstrated that the bundle ends in the complicated network of Purkinje fibers which lie directly beneath the endocardium and run to all parts of the ventricle, whereas Fahr states that in man the bundle does not connect with any meshwork of fibers analogous to the Purkinje fibers of the sheep, but terminates in the muscular wall of the ventricle.

In the fœtus the bundle can be recognized early in the development of the heart. In a fœtus 16 cm. in length the bundle could readily be made out, though the branching was not seen in such young embryos. In the fœtus there is no difference between the histological structure of the fibers of the bundle and of the heart muscle. In the adult the histological differences are very evident, for the fibers of the bundle retain their fœtal character.

Studies in Experimental Alcoholism.—Except for the anatomical changes resulting from the excessive use of alcohol, pathological anatomy has not been able to shed any light upon the effects on man of moderate amounts of alcohol. As regards the general effects of alcohol upon metabolism, it was formerly thought that alcohol retarded the oxidative processes of the body. Later it was held that alcohol acts as a food, and is used in place of carbohydrates, fat, and even proteids, which are thus stored up in the body. Reid Hunt (*Bull. Hygienic Laboratory*, 1907, No. 33), in a series of interesting experiments, is the first to show experimentally that profound modifications of certain physiological processes may result in a comparatively short time from doses of alcohol so small that indications of intoxication are absent. In these experiments the susceptibility of mice, which had been fed upon alcohol, to acetonitril was studied. Acetonitril, or methyl cyanide, is changed in the body into hydrocyanic acid, which unites with sulphur to be eliminated as sulphocyanic acid. The poisonous effects of acetonitril are thus due to the formation of hydrocyanic acid. From a series of experiments upon analogous substances Hunt formed the hypothesis that hydrocyanic acid is liberated from acetonitril through oxidation of the methyl group. In a long series of experiments it was shown that animals to which alcohol had been administered for some time acquire an increased susceptibility to acetonitril. This occurs after the administration of amounts of alcohol far too small to cause indications of intoxication, and from doses which almost certainly cause no anatomical lesions. This increased susceptibility is not due to a general "lowering of resistance," but is associated with a distinctly increased power of the body to break up the molecule of acetonitril. This is shown by the marked increase of sulphocyanate in the urine of the animals to which alcohol had been fed. This increased breaking up of the acetonitril depends upon the increased powers of oxidation on the part of the body. It is believed that these experiments afford clear experimental evidence for the view that extremely moderate amounts of alcohol may cause distinct changes in certain physiological functions, and that these changes may, under certain circumstances, be injurious to the body. The results also afford further evidence that in some respects the action of alcohol as a food is different from that of carbohydrates, and, finally, that in all probability certain physiological processes in "moderate drinkers" are distinctly different from those in abstainers.

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ORIGINAL ARTICLES.

THE CLINICAL AND PATHOLOGICAL DIFFERENTIAL DIAGNOSIS OF DISEASES OF THE FEMALE BREAST.

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In view of the comparative rarity of similar affections in the breast of the male I shall confine my remarks to diseases of the breast of the female. Malignant tumors, chiefly carcinoma, are by far the most frequent disease. It should be the object of the clinician to bear this in mind and to look upon every palpable mass in the breast of a woman as malignant until positive proof of its benignity is established. Up to twenty-five years of age malignant tumors are so infrequent that for practical purposes they need not be considered. Between puberty and twenty-five years of age lesions of the breast are benign.

Intracanalicular Myxoma. The most common tumor is the intracanalicular myxoma, or the so-called periductal fibromyxoma. This fibro-epithelial tumor is often multiple in one or both breasts. The single tumor is encapsulated, lobulated, and has a characteristic elasticity. It can be recognized at the exploratory incision by its definite capsule and, on section, by its myxomatous lobules, which are roundish and project above the cut surface. When these tumors are multiple in one or both breasts, small, give no pain, and exhibit no growth, operation is not indicated. They may remain quiescent for years and may ultimately disappear. Operation is indicated when one of these tumors gives much pain or exhibits growth. It is then only necessary to remove the tumor. This can be done with a small scar and without interference with later lactation. It is interesting to note that breasts the seat of single or multiple intracanalicular myxoma lactate in a normal manner, and the tumor, in its parenchyma, undergoes lactation hypertrophy with the production of milk, like the normal breast. Billroth first observed this. I have seen it in two instances. The single intracanalicular myxoma, usually in women over twenty-five, may grow rapidly and produce a tumor occupying the entire breast. The largest recorded tumors of the breast have begun as intracanalicular myxoma. As this tumor increases in size cysts may form, and sarcomatous degeneration is likely to take place The huge tumors of the breast illustrated in the older monographs on this subject by Velpeau, Brodie, Billroth, and Gross are of this character, and were called serocystic sarcoma. In view of the tendency of large intracanalicular myxomas to become sarcomatous, every tumor of this character should be treated as a sarcoma. The tumor. an area of skin, the entire breast, and the major pectoral muscle should be removed in one piece. It is not necessary to remove the axillary glands.

FIBRO-ADENOMA. The next most common tumor of the breast between puberty and the age of twenty-five is the fibro-adenoma. This, like the intracanalicular myxoma, is a fibro-epithelial tumor. The fibro-adenoma microscopically is nothing more than an encapsulated area of normal breast tissue in which the parenchyma, in the early stage of the tumor, is greater in amount than in the normal breast. Later, the parenchyma undergoes pressure atrophy, and the tumor may become calcified. In my experience malignant tumors, either carcinoma or sarcoma, seldom arise in the fibro-adenoma. This tumor may be single or multiple, in one or both breasts. It is distinctly encapsulated, firm, and has not the elasticity of the intracanalicular myxoma; at the exploratory incision its distinct capsule distinguishes it from the circumscribed carcinoma. The treatment of the multiple fibro-adenoma is the same as that for the multiple intracanalicular myxoma. Lactation hypertrophy has also been observed in these tumors. This tumor has been noted outside the mammary gland, and might be looked upon as aberrant breast tissue.

DIFFUSE VIRGINAL HYPERTROPHY. A rare lesion of the younger female breast is the so-called diffuse virginal hypertrophy. It is a symmetrical enlargement of both breasts. The clinical picture is so distinct that it cannot be mistaken. Until recently carcinoma had never been recorded in this hypertrophy, but during the last two years I have observed carcinoma of the breast in two women, both over twenty-five years of age, in whom the breasts were the seat of this hypertrophy to a moderate degree. Unilateral hypertrophy occurs in the male, but all cases in the female, studied pathologically, have been fibro-epithelial.

Every single tumor of the breast in a woman over twenty-five years of age should be explored without delay. These tumors may be divided clinically into two great groups—doubtful and malignant.

Malignant Tumors. For the malignant tumor one proceeds, without an exploratory incision, to perform the complete operation for carcinoma. This extensive dissection was first advocated by Halsted. It consists of excision of the breast with a wide area of skin, a wider area of subcutaneous fat and fascia, both pectoral muscles, and the axilla, in one piece. This wound is closed, except for a gap which is immediately covered with skin grafts. The mortality of this operation in Halsted's clinic is less than 1 per cent.

During the dissection of the axilla and after the completion of the operation the condition of the axillary glands is carefully investigated by the surgeon. If he can demonstrate no evidence of metastasis, or only the involvement of the lower or basal axillary glands, the operation is considered complete. However, if metastatic glands are found higher than the basal glands, the surgeon should remove a triangular mass of tissue in the supraclavicular fossa, bounded below by the clavicle and the subclavian vein, and on the medial side by the internal jugular vein. The dissection should be carried along the vein above the level of the omohyoid muscle, and along the clavicle to a little beyond the junction of the middle and the outer third. No matter how early one operates for a malignant tumor of the breast, the operation should never be restricted.

The statistics in Halsted's clinic up to the present time show that among 210 cases, in which three years or more have passed since the operation, 42 per cent. are apparently well. If we consider the cases in which the axillary glands, studied microscopically, showed no evidence of metastasis, 61 cases, or 85 per cent., are well. In cases in which the axillary glands showed metastasis (110), 30 per cent. remained free from recurrence for three years. When the glands in the neck showed metastasis (40 cases), only 10 per cent. remained well for three years. In all of these groups metastasis has been observed after an interval of three years of apparent cure. Such late metastasis may take place up to eight years after operation. Excluding these cases of late recurrence, the definitely cured in these three groups is reduced to 75, 24, and 7 per cent. respectively, or for all cases together, 35 per cent. I have not time to give the facts, but there is evidence to indicate that when the microscope fails to demonstrate metastatic cancer cells in the lymphatic glands in the axilla, this is not a positive proof that metastasis has not taken place, and for this reason and others, which space prevents me from stating, there should be no restriction in the complete operation for carcinoma of the breast.

When one cannot make a diagnosis of malignancy in a tumor of the breast, of course it is not justifiable to perform the complete operation. It is quite true that in a woman over twenty-five the probabilities are in favor of carcinoma, but there are a number of benign lesions which may appear in the breast of a woman at any age past twenty-five years, and in which conservative measures may be employed. In such cases one explores the tumor with the knife, cutting through the skin and subcutaneous fat directly over the tumor. In the majority of malignant tumors the nature of the disease can be recognized, before the tumor is reached, by the infiltration. Time forbids a detailed discussion of how the various lesions of the breast can be recognized at the exploratory incision, but the fact remains that this can be done, and it is the only method which allows an immediate decision as to the nature of the tumor. If the explored tumor prove to be malignant, one cauterizes the wound with pure carbolic acid or the Paquelin cautery and proceeds at once with the complete operation for carcinoma. My personal study of cases of carcinoma of the breast in which a clinical diagnosis could not be made, and in which exploratory incision was performed and followed at once by the complete operation, has shown that there is no evidence that cancer has been disseminated by this procedure.

When the tumor explored is not malignant the extent of the operation is governed by two factors—the nature of the tumor and the condition of the surrounding breast. The procedures are: Excision of the tumor only; excision of the entire breast; and excision of both breasts. The indications for these will be discussed later.

The clinical signs of a malignant tumor are based upon the palpation of the tumor, and the changes in the skin, subcutaneous fat, and the nipple. To diagnosticate a malignant tumor from palpation only requires great experience. The diagnosis of malignancy can be made positively by the demonstration of retraction of the nipple, any dimpling, fixation of the skin, or atrophy of the subcutaneous fat. Measurements of the various diameters of the breast with the nipple as the centre have proved to be of great aid. Shortening of the diameter in the quadrant in which the palpable tumor is situated is almost pathognomonic of cancer; increase in this diameter may be due to a benign lesion.

The symptoms of onset in tumors of the breast are: Tumor, pain, retraction of the nipple, dimpling of the skin, discharge from the nipple, and palpable axillary glands. In the majority of cases tumor is the symptom of onset. In a few, pain may precede the appearance of the tumor days, weeks, or months. Persistent localized pain in the breast shoud make one suspicious of a tumor formation. I have never explored the breast for pain only. Pain is not a symptom of malignant tumor only; in fact, it is more common in benign lesions as an early symptom or the symptom of onset, especially in cysts, senile parenchymatous hypertrophy, and fibro-adenoma. It is a late symptom in cancer. Retraction of the nipple may be looked upon as pathognomonic of cancer. It is rarely the first symptom. I have observed it but once without a palpable tumor, and in this case the exploratory incision revealed a small infiltrating scirrhus. Dimpling of the skin in a few instances has been first observed by the patient. In all of my observations a tumor was to be felt. A discharge from the nipple, except during lactation, may be looked upon as a sign of a benign lesion and not a symptom of cancer. If the discharge is blood or a cloudy serum, this is a positive sign of a cyst with an intracystic papillomatous growth. In these cases such a discharge is frequently observed by the patient for months or years. In senile parenchymatous hypertrophy one can express sometimes from the nipple a thick, brownish material—the accumulation of degenerated, desquamated epithelium in the dilated ducts. The patient seldom observes this. In a few cases the patients observed palpable glands in the axilla before they felt the tumor. Until recently I had never observed large palpable glands in the axilla without finding the tumor in the breast; but lately I have seen such a case. I do not look upon palpable glands as any aid in the differential diagnosis of tumor of the breast. If the glands are large or hard enough to be of themselves diagnostic of cancer, the tumor is also clearly malignant clinically. Palpable glands of a non-malignant nature are so frequent in the axilla that their presence or absence cannot be utilized as evidence for or against the malignant nature of the palpable tumor in the breast.

In spite of a large and increasing experience in tumors of the breast, surgeons will find that a clinical diagnosis is not always possible. The earlier patients seek advice after the first symptom the more frequently will this occur. For this reason a surgeon must educate himself to differentiate between the benign and the malignant tumor of the breast at the exploratory incision. Some surgeons prefer, at the exploratory incision, to cut out a piece for immediate frozen section and microscopic study; this can be done in about ten minutes. For the last three years I have had made immediate frozen sections of fresh tissue received in the pathological laboratory, but up to the present time a stained frozen section has never been of aid in making the diagnosis when we have been unable to come to a conclusion from the fresh appearance of the tissue, nor, up to the present time, have I ever depended upon a frozen section to influence the operative procedure; I have always been governed by the decision made from the study of the fresh appearances at the exploratory incision.

THE POSSIBLE TUMORS IN THE BREASTS OF WOMEN OVER TWENTY-FIVE YEARS OF AGE. In view of what has been said, we are interested in all the benign lesions and those forms of carcinoma in which a clinical diagnosis cannot be made. For further details beyond those possible in this short paper, I should like to refer to other papers.[1]

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[1] Surgery, Gynecology, and Obstetrics, December, 1906, vol iii, p. 721, in which I discussed senile parenchymatous hypertrophy of the female breast, and its relation to cyst formation and carcinoma; The Bulletin of the Johns Hopkins Hospital, April, 1907, on benign and malignant cysts of the breast; and the Journal of the American Medical Association, November, 1906, vol. xlvii, p. 1470, on the importance of an early recognition and the operative treatment of malignant tumors.

The tumors of the breast which may appear clinically doubtful can be separated into two great groups—the larger group, the solid tumors, and the relatively smaller group, the cystic.

SOLID TUMORS OF THE BREAST. The solid benign tumors are: The intracanalicular myxoma, the fibro-adenoma, the cystic adenoma, tuberculosis, non-tubercular mastitis, and senile parenchymatous hypertrophy. Any form of solid cancer or sarcoma may in its early stage be clinically doubtful. All solid tumors of the breast may appear either as distinctly encapsulated, circumscribed nodules, or areas of induration. If a tumor, no matter what its character, is buried in the breast tissue, one does not palpate directly the tumor, but the surrounding breast. For this reason encapsulated tumors may give to the palpating finger a sense of a non-encapsulated mass, due to the feeling of the condensed breast tissue surrounding the tumor. If the tumor has covering it only skin and fat, its nature and consistency are more readily demonstrable. But if the patient has large breasts and thick subcutaneous fat. and the tumor is small, it is very difficult to ascertain from palpation the exact nature. Further discussion is not necessary. The facts are that it is frequently impossible to make a positive diagnosis of a tumor of the breast in a woman over twenty-five; so that, at the exploratory incision, any one of the possible tumors mentioned may be exposed.

The *intracanalicular myxoma,* which I have discussed, is most easily recognized. I have observed these tumors to arise up to forty-two years of age. The fibro-adenoma may be confused with a circumscribed scirrhus carcinoma. In the laboratory I have received from outside sources a number of such specimens in which a circumscribed carcinoma has been removed on the diagnosis of a fibro-adenoma, and in a few cases in which the complete operation for carcinoma had been performed the tumor proved to be a fibro-adenoma. A careful study at the exploratory incision should make the diagnosis. The carcinoma is never encapsulated, while the fibro-adenoma is. If the surgeon be in doubt, I should advise the complete operation.

The *cystic adenoma* is a relatively rare tumor. I have seen but 10 cases. The tumor originated between the ages of twenty-five and thirty-eight. It was fairly encapsulated, and from the capsule there projected minute cysts, 2 to 5 mm. in diameter, with various-colored contents. These must be distinguished from the early adenorcarcinoma which is not encapsulated, but has a condensed outer zone and shows infiltration to a slight extent in the surrounding breast. The little cystic cavities in the malignant tumor are present within the condensed zone. There should be no difficulty in differentiating the benign tumor from the malignant.

Rarely do we see *tuberculosis* before abscess and sinus formation. This disease quite frequently involves only one breast in women between twenty and forty with no evidence of tuberculosis elsewhere.

Contrary to the general opinion, its onset is very infrequently observed during lactation. In the early stage one feels simply an area of induration. At the exploratory incision, in my experience, caseation and tubercular granulation tissue have been present and allowed a positive diagnosis. Up to the present time in some 20 cases complete excision of the breast has been employed in Halsted's clinic, but we have had opportunity to see late cases only. Perhaps in the early stage, in which only a small zone of the breast tissue was involved, excision, with preservation of the remainder of the breast might be employed, especially in younger women.

Non-tubercular mastitis, except when associated with lactation, is a very rare lesion. Yet, I am impressed with the frequency with which indurated areas in the breast, not associated with lactation are looked upon as mastitis, and for this reason operative interference is delayed. Pyogenic mastitis with or without abscess formation and not associated with lactation is possible. I have observed not more than 6 cases among at least 1200 diseases of the breast. It may be secondary to a general infectious disease, to an infection of the arm or axilla, to traumatism, or it may be associated with pyogenic osteomyelitis of the rib. Of course, if one sees the patient after an abscess has formed, the diagnosis is not difficult. But before abscess formation I should never make such a clinical diagnosis, and should always explore such an area of induration.

It is very important for the general practitioner to know that malignant tumors of the breast may arise during pregnancy or after lactation is established. A caking or induration of the breast before the birth of the child in a woman over twenty-five, I believe, should always be immediately explored. In my experience it is either tuberculosis or carcinoma. Lactation mastitis, with rare exceptions, has its onset before the fourth month after the birth of the child An induration in the breast of a nursing woman, if due to lactation mastitis, should show in a few days either evidence of resolution or the clinical appearance of an abscess. In the latter event incision and drainage are indicated. When the area of induration persists, and yet shows no evidence of abscess formation, one should be suspicious of tuberculosis or carcinoma, and immediately explore the indurated area. I have ob-observed 8 cases of carcinoma in the lactating breast and 2 of tuberculosis. In all the onset was after the fourth month; all unfortunately were treated for some months on the diagnosis of mastitis; in only one patient has the radical operation accomplished a cure. What the results of earlier intervention would have been it is impossible to state. I have observed 4 cases of carcinoma which have originated from ten to thirty years later in the indurated area of a lactation mastitis which had never disappeared.

Chronic lactation mastitis, with the formation of a chronic abscess, is possible I have observed but 2 cases. Operation is indicated, and the differential diagnosis from carcinoma can be made at the exploratory incision. Very rarely does a malignant tumor of the breast suppurate, but on two occasions I have observed abscess formation in medullary carcinoma. Both patients had been treated by incision on the diagnosis of mastitis before they were admitted to the clinic.

The foregoing covers the possibilities of benign solid lesions in the breasts of women over twenty-five years of age. It has been my experience that their naked-eye characteristics are, in the majority of instances, sufficiently clear to allow a diagnosis from the malignant tumors.

CARCINOMA of the breast may be divided into adenocarcinoma, medullary, and scirrhus. The latter two are perhaps more easily distinguished than some of the adenocarcinomas. Pathologically we may subdivide adenocarcinoma into the following groups: Comedo adenocarcinoma (duct cancer); colloid adenocarcinoma; adenocarcinoma beginning in a circumscribed cystic adenoma; adenocarcinoma beginning in senile parenchymatous hypertrophy; and adenocarcinoma beginning in a cyst with a papillomatous growth. This latter group will be discussed under the cystic tumors.

The *comedo adenocarcinoma* begins as a circumscribed tumor. Many of our cases have been clinically doubtful in women over forty. On cutting into this tumor, it is found circumscribed but not encapsulated; the surface shows trabeculæ of fibrous tissue in the meshes of which there are round, granular areas, from the centre of which worm-like comedo bodies can be expressed. The appearance of this tumor is absolutely characteristic—once seen it will never be forgotten. In my experience with 11 cases none has shown metastasis to the axillary glands; all have remained well. As the tumor grows it infiltrates the skin, ulcerates, and produces a fungous growth. Two such patients, one with a recurrent tumor, have remained well a number of years after operation. In this group there have been no late recurrences, but in all the complete operation was performed. It represents the least malignant form of cancer of the breast. But even with these facts, I should not advise a restricted operation.

Colloid adenocarcinoma in its onset is a small, circumscribed, clinically doubtful tumor. At the exploratory incision the tumor has a thin capsule. On section one sees between narrow fibrous trabeculæ bulging pink, gelatinous lobules—an appearance which could not be mistaken for any other tumor. Although I have tissues from 11 cases in the laboratory, the records are complete in only 3, which were treated in Dr. Halsted's clinic. I am of the opinion that this tumor may be multicentric in origin, because, when the first tumor is removed, there have been recurrences in other parts of the breast. In one of Dr. Halsted's cases there were four recurrences after excision of the tumor only before the patient was admitted to this clinic. This patient has been free from any return of the disease four years since the complete operation. Although the glands did not show metastasis in any of the cases in which the axillary tissues were removed, I believe the complete operation should be performed for the colloid tumor.

Adenocarcinoma beginning in circumscribed cystic adenoma has been described in the discussion of cystic adenoma. This tumor is relatively more malignant than the comedo or colloid type. It has a tendency to infiltrate the breast and to produce a scirrhus or medullary carcinoma. I have observed metastasis to the axilla in 2 cases, which were still pathologically very early carcinoma.

Adenocarcinoma Beginning in Senile Parenchymatous Hypertrophy. This hypertrophy which is called abnormal involution by Warren, of Boston,[2] chronic cystic mastitis by Billroth, cystadenoma by Schimmelbusch, and Réclus' disease by French surgeons, is a parenchymatous change in the breast of women before or during the menopause. It differs in gross appearance from a cystic adenoma only in the fact that it is diffuse and not circumscribed. It is multicentric in origin, and arises in one or more areas of one or both breasts. When it produces multiple areas of induration in one or both breasts, it is not difficult to recognize clinically. When it involves but one area or quadrant of the breast the diagnosis is suggestive, by the lengthening of the diameter of the involved quadrant. I am of the opinion that immediate exploration is always indicated, as I shall discuss under cysts of the breast. When this hypertrophy tends to the formation of single or multiple smooth-walled cysts, cancer is rarely observed. For this reason, in the cystic variety, conservative measures are indicated. But in the second type, in which the cysts are small and filled with epithelial debris or papillomatous growth (the adenocystic type, Bloodgood), carcinoma is a very frequent result. When the lesion is still benign the entire breast should be removed, and in some instances, to be discussed later, both breasts. When the lesion has become malignant, it generally has manifested itself by retraction of the nipple or some involvement of the skin; if not, at the exploratory incision the increase of new connective tissue between the little cysts, and the finely granular areas of carcinoma, which can be expressed, will allow a positive diagnosis of cancer. If the surgeon is in doubt. I should advise the complete operation.

Medullary Carcinoma. This tumor in its onset may be a small, circumscribed, clinically doubtful nodule. I have observed one such tumor but 1 cm. in diameter.[3] At the exploratory incision there is no distinct capsule, and the soft, finely granular friable tumor should not be mistaken for any other lesion.

Scirrhus Carcinoma. The small infiltrating scirrhus usually very quickly manifests definite symptoms of a malignant tumor, by retraction of the nipple or fixation of the skin. But in a few cases the patient seeks advice so early in the onset that one only feels in the breast a small area of induration. When such a lesion is cut down upon, the star-like mass of fibrous tissue, containing in its trabeculæ fine granular areas, has such a distinct appearance and feeling to the knife and finger that a diagnosis can be made as readily as with the microscope. The larger infiltrating scirrhus is always clinically malignant.

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[2] Amer. Jour. Med. Sci., April, 1907.

[3] Dr. Welch has just shown me a second case.

Scirrhus carcinoma may occur in the breast as a circumscribed nodule, and may feel like an encapsulated nodule, suggesting a tense cyst or adenofibroma. Judging from the specimens sent to the laboratory from outside sources, this malignant tumor has been mistaken for a benign tumor more frequently than any other. A careful investigation, as I have already mentioned, will demonstrate the absence of a capsule, which distinguishes it from the adenofibroma. I take this opportunity to warn surgeons and pathologists not to depend upon the rapid frozen section for the differential diagnosis of these two tumors. The old adenofibroma in which the epithelium-lined spaces are undergoing atrophy, resembles, in the frozen section, a scirrhus.

CYSTIC TUMORS OF THE BREAST. I have recently discussed these before the Johns Hopkins Hospital Medical Society.[4] The galactocele—a dilatation of a duct in the lactating breast—can be recognized by its milky contents; the chronic abscess in the lactating breast by its wall of granulation tissue and purulent contents. The simple cyst, which may arise at any stage of senile parenchymatous hypertrophy, has a distinct wall, a smooth inner surface, and non-hemorrhagic, clear or cloudy contents. The cancer cyst, which has been observed in both the lactating and the non-lactating breast, has a thicker wall, less differentiated from the surrounding breast than the simple cyst, hemorrhagic contents without a papilloma to explain the hemorrhage, or thick, grumous, granular contents due to broken-down cancer cells. A smooth-walled cyst without a papilloma containing blood has, in my experience (6 cases), invariably been carcinoma.

The benign cyst with a papilloma has the same wall as the simple cyst, but projecting from the wall at one point there is a small or large papilloma; the contents may be bloody; there is usually a history of discharge of blood from the nipple. In the malignant papillomatous cyst the distinct wall beneath the base of the papilloma is lost and replaced by solid cancer tissue. The papilloma has lost its characteristic lobulated surface, and usually looks like a soft medullary carcinoma.

I have observed but one sarcomatous cyst of the breast—a specimen sent to me by Dr Pancoast, of Baltimore. Clinically it was a doubtful tumor in a woman of sixty. Although the contents were clear, the wall of the cyst was composed of soft, friable, granular tissue, specked with blood. Histologically it was a perithelial angiosarcoma. Dermoid cysts may occur buried so deeply in the breast that they cannot be distinguished from primary breast tumors. The benign dermoid has a distinct thin cyst wall and the usual granular dermoid material. In the malignant dermoid the wall is thicker, cannot be enucleated from the surrounding breast tissue, and on section has the granular appearance of cancer. The contents of the malignant dermoid do not differ from that of the benign.

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[4] Bulletin of the Johns Hopkins Hospital, April, 1907, p. 139.

Notwithstanding an indefatigable clinical study of breast tumors from every possible data, and after the most careful palpation, surgeons will meet with tumors in which a clinical diagnosis is not possible, and for which an exploratory incision must be done. Surgeons can train themselves to recognize these tumors at this exploration by the careful inspection of all tumors of the breast the moment they are removed; a microscopic study of the tumors should follow. The clinically doubtful tumor does not differ at all macroscopically from the one in which a clinical diagnosis is possible. Among the malignant tumors of the breast, in the majority of clinics in 90 per cent., the surgeon will be able to proceed with the complete operation without an exploratory incision, so that he will have an average of nine opportunities out of ten to familiarize himself with the gross and microscopic appearances of carcinoma, and thus prepare himself for the few cases in which the tumor must be recognized at the exploratory incision. With this training the surgeon will subject his patients to the complete operation for carcinoma only when the tumor is really a carcinoma, and he will not mutilate his patients suffering with benign lesions unnecessarily, nor will he make the fatal mistake of doing a conservative operation for cancer. I should advise that, until this knowledge is gained, it is better to perform the complete operation in doubtful cases. On the whole, less harm will be done and more good accomplished. Cancer of the breast cannot be cured when the tumor is first excised for microscopic study and the complete operation performed later. The complete operation must follow *immediately* the exploratory incision.

There are two other very interesting problems in the operative treatment of breast tumors. The answer to the first I cannot give at the present time. But I am impressed with the fact that a certain form of carcinoma is very frequently bilateral. At least a number of patients return with similar carcinoma in the other breast. I am investigating at the present time whether it will be possible to isolate these cases, and whether when we perform the complete operation for the tumor in one breast, we can, with some justification, remove the other breast, because the pathology of the tumor removed indicates with great probability that later a similar tumor will appear in the other breast. I shall have to leave this for a future communication.

The answer to the second problem, I think, can be given. When the surgeon cuts down upon a clinically doubtful tumor in a woman before or at the menopause, and finds a benign tumor—an intracanalicular myxoma, an adenofibroma, a cystic adenoma, or a small simple cyst—and during the dissection of this tumor his investigation of the surrounding breast tissue demonstrates the presence of senile parenchymatous hypertrophy of the adenocystic type, I am confident this breast should be completely removed. As this disease is so commonly bilateral, it has been my practice the last few years to remove both breasts. In my first case, some eight years ago, the patient refused the double operation. She succumbed to cancer of the other breast five years after the operation

Sarcoma of the Breast. I have never observed a sarcoma in a small intracanalicular myxoma. I have discussed this probability in the larger tumor, and the rule of the more extended operation. Primary sarcoma of the breast not arising in intracanalicular myxoma is a rare tumor. I have observed but 2 cases. They may not be distinguished from medullary carcinoma, but can be easily differentiated from any benign lesion. The rarity of the diagnosis of sarcoma in the Surgical Pathological Laboratory of the Johns Hopkins Hospital may be due to the fact that we have called some sarcomas medullary carcinoma, and I have a group of medullary carcinomas which I have separated as resembling sarcoma. The complete operation has always been performed, but up to the present time no cure has ever been accomplished, except in the sarcoma which arises from the intracanalicular myxoma, and here only when the major pectoral muscle has been removed.

I have not mentioned the non-indigenous benign tumors of the breast—lipoma, fibroma, enchondroma, and the so-called mixed tumors of the breast. We have had but one example of each, except the fibroma. They were easily recognized.

SOME FUNDAMENTAL PRINCIPLES IN THE TREATMENT OF FUNCTIONAL NERVOUS DISEASES, WITH ESPECIAL REFERENCE TO PSYCHOTHERAPY.

By Joseph Collins, M.D.,

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Nervous diseases have acquired an undeserved reputation for incurability and unamenability to treatment. This reputation antedates their recognition, description, and interpretation, and is founded in ignorance. Like all bad reputations, it is difficult to overcome, and, however humiliating the admission may be, it must be granted that physicians have not done their best to give these diseases a good character. But I do not wish to spend time in comparing them with other diseases from the point of view of curability, for that would serve no purpose other than to reiterate that which I have often said, viz., that nervous diseases yield more uniformly to treatment than any other class of diseases of comparable nature and severity. It is, of course, understood when I speak of diseases influenced by treatment that I do not include self-limiting diseases. I desire rather to present a brief sketch of present-day therapeutic tendencies from the point of view of the practitioner who has much to do with nervous diseases, instead of a *resume* of therapeutic novelties in neurology. Practically, all nervous disorders and diseases are chronic. The organic are painful, incapacitating, and deforming; the functional, more potent to cause misery and suffering than any other form of disease.

There are certain cardinal principles in the treatment of all nervous diseases, principles which obtain as well in the treatment of all chronic disease, but which are more important in the former because, constituting as they do a moral and disciplinary *regime*, they make leading appeal to the patient's mind, and the mind has a more commanding dominion over this class than over any other. Were I to say that a correct diagnosis is by no means necessary for the successful treatment of many neuroses, I might be looked upon with suspicion and hailed as an apostle of retrogression. Still, I make that statement, trusting that I may be understood, and, as evidence of the truth of it, I submit the testimony offered by faith curists, christian scientists, osteopaths, shrines, charlatans, and "systems" innumerable. No one denies, I fancy, that actual cures of apparently real disease are effected through these agencies, and in some instances after the legitimate practitioner of medicine has tried and failed. Yet in each of these instances a diagnosis was lacking. I am not now attempting to show that a diagnosis is not a most desirable factor in the successful treatment of any disease, for it is naturally the only way of safe-guarding the sick. I am merely emphasizing the fact that no source of knowledge is too mean or contemptible for us to disdain it, and, that it does not detract from the dignity of our calling to admit the instructive value of these sources. Whether or not there have been periods in the history of civilization in which the supernatural, the mediatorial, and the "miraculous" have been more invoked and utilized in the treatment of disease than they are to-day cannot, I think, be determined, but that these are rampant at the present time is obvious to every thoughtful person. This condition of affairs may be interpreted as evidencing (1) that the mind has a not easily calculated influence over the body to influence it beneficially or detrimentally (which everyone knows or professes to believe); (2) that this influence is being utilized meretriciously (as must always be the case) by many persons outside of the medical profession; and (3) that ignorance or neglect of the important part played by moral treatment in the cure of nervous disease necessarily tends to our discredit in the exact ratio in which it tends in the given case to the patient's disadvantage.

It is not alone in the so-called functional diseases, such as the neuroses and psychoneuroses, that moral treatment is efficacious. It may truthfully be said that in the organic diseases, aside from those caused by syphilis or dependent upon syphilitic lesion, it is far more efficacious than medicine. Yet what is heard of it in our medical schools? Think for a moment of the countless words that have been said and written about the innumerable substances that are remediable in tabes, in myelitis and disseminated sclerosis, in epilepsy? And what has it profited? It has served only to show in these, as in all nervous diseases, that medicine by itself alone is practically worthless.

The physician whose work lies with neuropaths has it forced upon him sooner or later that it is the plan of treatment, embracing as it does the systematic utilization of measures that have been shown experimentally and empirically to restore bodily tone, to improve general and local nutrition, to add functional potentiality, to aid in dislodging fear and overcoming that infirmity of the will, want of self-reliance—it is the plan of treatment that must be taught and practised if we would be just to our patients and true to ourselves. And it is this plan of treatment and all that it stands for in conjunction with the means employed to get possession of the real facts concerning the patient's ailment that spells psychotherapy.

How difficult it is to formulate this plan of treatment and put it in words that are not trite and expressive of sentiments that are not commonplace, no one can know who has not essayed to do it. This is the chief obstacle in the way of systematic instruction along these lines in our medical schools and hospitals. I am opposed to the claim that it requires special skill to treat nervous disorders successfully, and I contend that the general practitioner should study the proper manner of treating them, with the same care that he studies infant feeding or the treatment of typhoid fever.

The first and perhaps most important thing in the successful treatment of nervous disease is to convince the patient that his disorder is fully understood, that the features of it, which in his judgment are unique and mysterious, are perceived with a clarity that amounts almost to clairvoyance, and that the physician stands between him and danger. This may be called "inspiring confidence," but it is really much more than this, for the patient may have confidence in a physician's skill and judgment without harboring any of the above-mentioned convictions; nor is this relationship between the physician and the patient to be established by verbal assurance on the part of the one and the most explicit statement on the part of the other. That to which I refer is a sentient condition of the patient that develops unconsciously, a condition which may be created by careful and solicitous attention to his story, by judicious imparting of result of a comprehensive and minute examination, by observation and conclusions based thereon, and by appropriate psycho-analysis. Each one of these plays its part, and one may not supplant or replace another.

The longer I study patients and the more intimately I become acquainted with their infirmities, the more I become convinced that imaginary maladies are very rare, and when they occur they are real! Patients are apprehensive of the seriousness of their symptoms, they anticipate disaster, they dread impending occurrences that they cannot withstand, but these do not constitute the symptoms of an imaginary malady; they constitute the symptoms of disorders of which fear and want of self-reliance are the principal features. Neither does it avail to tell such sufferers that there is nothing the matter with them, nor to treat their confidences lightly or indifferently. No normal, healthy minded person willingly brings such misery exciting phenomena into his consciousness. If the physician takes the trouble and employs the means to determine the genesis of these, and of perhaps even more terrorizing fears, he will be in a much stronger position in the effort to dispel them after he has impressed the patient by his mode of eliciting the details underlying his emotional status. One of the things which frequently impresses nervous patients most favorably is the realization that the physician knows without being told what his symptoms are better than the patient himself does. Such knowledge may come from experience or it may come from what is commonly called intuition, which is really observation and inference—that quality which so many of us find entertaining in Sherlock Holmes. But few men can hope to vie with Hadig and Sherlock Holmes in this keen observation and unerring deduction. Hence the so-called psycho-analytic method has a field of usefulness and a brief mention of the part that it plays in the treatment of nervous diseases becomes necessary.

It is well known that patients with that peculiar group of symptoms that are subsumed under the captions of neurasthenia and psychasthenia have often great difficulty in formulating their complaint, or, to employ legal phraseology, in furnishing a bill of particulars, of their complaint. They know that they are apprehensive, agitated, anxious; that the voices that they hear in solitude are dominant; that there is no peace of mind, no contentment, no happiness for them; but they are unable to say why this is so and whence it comes. Then again there are many patients with obsessions, fears, self-depreciation, morbid conscientiousness, and conduct and emotions based upon these emotional states, who are entirely ignorant of the causes of their condition. Indeed, it is ofttimes for the cause as well as for the relief of these symptoms that they seek counsel. It is in such cases that the so-called psycho-analytic method is of great importance. This method is based upon the association of ideas; upon the common knowledge that memory ideas are associated with sense impressions. Everyone knows that an object or word seen or heard, an environment, a sound, an odor reminds us of something concrete or something which in turn brings up other associations of time, place, or emotion. Psychologists have determined the conditions under which these associations arise, the influence which the frequency and the recency of the memory picture and its associated ideas have upon the kind and character of the evolved impressions as made manifest in the resulting idea. The time that elapses between the articulation of a word and the mental photograph which expresses the idea that is invoked in the hearer's mind is called the reaction time. Experimenting with a large number of words, we find that the normal reaction time for the average individual is very short, generally less than a second, and is not subject to much variation. For some words, however, if a long series of words be tried, a much longer time elapses before a verbal association is announced, oftentimes four seconds and more. Repetition of the test at different times shows that it is always the same words that have this protracted reaction time. If these words are selected and collated, it may not infrequently be seen that they have some personal association or reference, and, taken alone or in conjunction with the patient's story, they may be used as the key to unlock the latent memories that are, consciously or unconsciously, disturbing the patient's peace of mind. Then once they are brought up where they can be squarely attacked, they may be subjected to well-recognized modes of psychical or moral treatment.

The so-called method of psychic analysis and its application therapeutically is based largely upon investigations of Breuer and Freund, of Vienna, more particularly the latter, who sought to detect the primary appearance and manifestation of certain symptoms in hysteria, psychasthenia, and neurasthenia, and, having in many instances detected them, contends that hysterical individuals suffer from reminiscences of a distressing character, which act as disease producers after the lapse of years. These pathogenous recollections refer to unpleasant occurrences which have not been sufficiently "dispelled," that is, to which adequate reaction failed to occur; such reactions are tears, laughter, an act of vengeance, complaints, motor outbursts, etc. Man tends to "externalize" his psychic emotion. If appropriate reaction fails to occur, the mental imprint of the occurrence retains the "emotional accentuation," as is the case, for instance, in an unretaliated insult. Ideas which are no longer emotionally accentuated disappear in the course of time, according to the process which we designate as "forgetting."

Imperfect reaction is doubtless dependent upon existent conditions in the particular case. The emotional factor may be so excessive in degree that all ways and means of reacting prove inadequate.

Or the patient may have temporarily "pushed aside" some painful concept from his conscious thought, in the endeavor to forget it or to drive it away from his consciousness.

The attempt of the individual to get rid of the painful concept by pushing it aside is apparently successful; but somewhere and somehow in the psychical organism the painful concept persists and, possessing a "traumatic" value, acts as the stimulus of an irritation on the nervous system. These "irritations" form the symptoms of various nervous diseases. A neurosis represents the reaction to endogenous stimuli. The important thing after this subconscious pathogenic stratum is laid bare is to deliver the patient of it. Freund avails himself of hypnosis and similar methods. Therapeutic success is a relative test of the accuracy and completeness of the patient's statements. As soon as the reminiscence has been transferred into waking consciousness, the symptom subsides. The therapeusis is to render the subconscious accessible to consciousness, and this is accomplished by overcoming the resistances. In severe cases this psycho-analysis becomes an extremely difficult and protracted task. Freund estimates it at from six months to three years.

The power of interpreting the significance of psychic phenomena can doubtless be acquired in some measure by everyone. As Jung[1] almost sarcastically remarks, "Anyone may repeat association experiments at his pleasure." The question always remains of what value may be his deductions? Natural aptitude and experience will determine the extent to which the practitioner will acquire facility in interpreting the results of a psycho-analysis. Some may find themselves unfitted for this work. Not every physician is *ipso facto* a surgeon—nor would be such—and many an able surgeon would willingly seek medical counsel when presented with the intricate problem of an infant's inarticulate complaint.

NEURASTHENIA AND PSYCHASTHENIA. One of the most important steps that have been recently taken in the extension of our knowledge of the neuroses is the establishment of the condition known as psychasthenia, in contradistinction to neurasthenia. It may be assumed that the word neurasthenia now has a fairly definite meaning attached to it. It may still be used rather loosely by the laity, but when a physician says that a patient has neurasthenia, he means that his patient has a general depression of the nervous system and asthenia of the entire organism, psychical, sensory, motor, vasomotor, trophic, etc., and particularly characterized by mental depression manifesting itself in the attention, in the memory, in volition, and in other dominant mental qualities, and accompanied by symptoms that are so constant as to be considered stigmata (headache, insomnia, muscular weakness, gastro-intestinal disturbance, peculiar mental state), and other symptoms subject to great variation, referable to different organs of the body, constituting the circulatory, the visual, and the genital systems. Neurasthenia is a sign of the times. Strenuousness is the soil in which it flourishes. But we shall not discuss its causation, which would involve much enumeration of predisposing conditions, nor its manifestations. I wish more particularly to call attention to the condition known as psychasthenia, a name given by Janet to constitutional psychoneurosis, usually hereditary and characterized by psychical and physical symptoms, obsessions and impulses, fears, anguish, tics and aboulia. These symptoms have long been known to physicians and especially to those interested in nervous and mental diseases, but it is only recently that they have come to be looked upon as factors of autonomous nervous or mental disorder.

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[1] Münch. med. Wochenschr., 1906, p. 2302

Psychasthenia as a disorder has its origin in a neuropathic constitution which is inherited, not acquired. It is quite different from neurasthenia, although neurasthenic symptoms are usually associated with it. Indeed, it may be said to induce neurasthenia, and the somatic accompaniments of the disorder, objective signs and symptoms, when there are any, are those of neurasthenia. The chief mental symptoms are obsessions or compulsory ideas which come into the consciousness abruptly and take possession of it autocratically, usurping to any degree the normal content of the mind. The patient makes his best effort to prevent them or to circumvent their dominant operation, but to no purpose. They are inimical to ordinary habits of thought, and while operative, the victim is given over entirely to their sway, though he can usually inhibit their externalization and even conform his conduct to what seems to be normal. It is fortunate that this is the case, as the obsessional idea is quite often the opposite of that which normally characterizes the individual, and if it were acted upon, disaster to others, often to those of whom he may be fondest, would be the result. The patient realizes how morbid the thought engendered by the obsession is, and he can reason about it, discuss its various ramifications, and in a general way conduct himself toward it while analyzing and attempting to interpret it, as if it were the possession of another person, but even while so engaged he feels that he is within its grasp and that he has no power to free himself from it. Many instances, such as stealing, incendiarism, and other criminaloid acts, naturally may be the immediate sequence of such obsessional condition.

The second striking feature of the psychasthenic is a symptom which resembles this mental or emotional symptom that we have been describing, but which manifests itself usually in some form of motor display, such as a twitching movement in some part of the body, usually one of the extremities, to which the name tic is given. These tics may be simple or they may be so associated that they are spoken of as systematized, or the motor display takes the form of some compulsory process such as senseless repetition, useless movements, overwhelming necessity for performing certain acts in a definite manner, such as stepping on a crack, taking so many steps in one direction, so many in another, and so forth in an endless variety; or, it may take the form of certain kinds of mental agitation, associated with counting and repeating, inquiring, doubting, etc. It is among these simple or systematized emotional agitations that morbid fears of every kind are to be included, fear that such and such conduct is not right, fear of disease, fear of animals, morbid scrupulosity, etc. And finally, the more common distinguishing feature of psychasthenia is the absolute lack of self-reliance. The psychasthenic hesitates to adopt a plan of action, he is irresolute about decision of all sorts, he is self-deprecatory, oftentimes to an absurd and apparently ludicrous degree, taken in conjunction with what appears to be excellent health, and he is consumed with a timidity and fear which the normal individual has great difficulty in realizing, but to which the victim himself is keenly alive.

Treatment. The treatment of psychasthenia, like the treatment of nervous disease founded on degeneracy, consists of two things: Treat the patient and treat the chief factor of the disorder, that is, heredity. Discussion of the latter does not come within the scope of these remarks. The problem that confronts us is what to do with the individual who comes as a patient.

The patient with neurasthenia will usually yield to treatment when the cause no longer exists and the general health has been restored. Such restoration usually follows the proper use of rest and exercise, massage, thermal and mechanical agencies, and the disciplinary entailment of such treatment. But in the majority of instances the patient with psychasthenia will not be cured without much more searching psychotherapy. As a teacher I find great difficulty in stating specifically and explicitly of what such treatment consists. It entails instruction in logic, in dialectic, in philosophy, stripped of all scholastic verbiage, and presented in the shape of plain statement of fact concerning the origin of the patient's ailment, the manner of its development, the reasons why it will be overcome and how it will be overcome, constantly holding up that happy contrast when it is overcome. Finally, we must engender a spirit of self-reliance and courage which is entirely inimical to fear and doubt. We must teach the philosophy that engenders a willingness to bear temporarily the frailties of the spirit and the flesh with the same fortitude that the mother bears the pain and suffering of childbirth, because of the flood of happiness that comes with the reward. We must conquer fear, dispel doubt, eradicate despair, and in the soil from which they have been uprooted we must implant seed which shall bloom as hope, courage, contentment, equanimity, and self-reliance. In order to do this, one must have it in one's self. As Emerson says: "When good is near you, when you have life in yourself, it is not by any known or accustomed way; you shall not discern the footprints of any other; shall not hear any name; the way, the thought the good shall be wholly strange and new. It shall exclude example and experience You take the way from man, not to man. All persons that ever existed are its forgotten ministers. Fear and Hope are alike beneath it."

Then there is that vast and far-reaching matter of suggestion that comes up for consideration in this connection. What is suggestion, how does it act, and how shall it be carried out? Take for example the literature that has developed concerning hypnotism, the therapeutic utility of which depends upon suggestion. Hypnotism is very little used by physicians today, because it has been found impossible to divorce it from the magical and supernatural, to draw from it the veil of mystery and the trappings of occultism. Furthermore, not improperly the trammellings of prejudice seriously interfere with its use, at least in this country. Yet we all admit that hypnotism is a potent way of using suggestion and we should be grateful in that it has assisted in establishing the value of that measure. But the potency of suggestion is quite as great without the mediation of hypnotism, though its application be not so tangible and direct. The suggestion that emanates from environment, isolation, painstaking care in the application of physical measures, from verbal assurance, from putting in proper perspective evidences of recovery even though they are slight, from all that is included under the head of discipline and obedience, cannot be too strongly emphasized. "Who has more obedience than I, masters me though he should not raise his finger."

It is not sufficient to show a psychasthenic that his ideas are not founded upon facts, that his actions or conduct do not flow from logical and legitimate inferences. It is necessary first to attack the fundamental state upon which these pathological, ideational, and emotional states depend. Ordinarily the most expeditious way of going about it is to restore or at least improve the general health. This is to be done by the proper employment of those measures which have been found so successful in neurasthenia: Isolation, alimentation, rest and exercise, and the use of such mechanical measures as massage, hydriatic procedure, electricity, and possibly also the use of symptom medicines. They of themselves or the discipline which they engender constitute the most important factor in the moral treatment of these patients, and the time when they are operative is the psychological moment to begin the moral treatment. At a definitely allotted time in the day the patient should be made to concentrate his attention upon work that requires his intellectual faculties and which is entirely foreign to self-contemplation, self-analysis, and introspection. It is in this respect that for example appropriate literature may be of great service. The patient may be made to read, or study rather, Plato or Emerson, or Marcus Aurelius, although in many instances I have to put them upon the baby diet furnished by Horace Dresser and other apostles of the new old thought who present their matter in a very simple way. Once the patient can concentrate his mind upon the Phaedo, or such excursions in the realm of independence and optimism as Emerson's Self-reliance and Compensation, and by perhaps a veritable *tour de force* shut out their morbid ideas, the dawn of recovery is at hand. Naturally such work is not pleasureable, but neither are some, perhaps all, of the physical measures that are at the same time being utilized to restore the patient's bodily health. It is done as a task, and it should be done with the seriousness and studiousness of a task, and with the same regularity and persistency as any of the physical methods co-incidently employed. Neither is it done alone; it is done in intimate association with some competent person, or with the physician who essays to treat him. After a time the task which seemed impossible and wholly beyond the patient's comprehension becomes easy and pleasant, and he extends his activities volitionally in directions which are indicated to him. Naturally in the beginning the pathological ideas assert themselves, and the physician is likely to be impressed with the aboulia and distractibility of his patient, but there are few cases that resist confident and protracted effort along these combined lines. Gradually there is brought about a reëducation of will power, a keenness and intensification of intelligence, and an expansion of sentiment. The patient's resources are increased. Life begins to have some charm for them, existence some purpose, and with the aid of the staff which the physician puts in their hands to steady them over trying and difficult situations, many patients are restored to useful lives, some to distinction and eminence.

Then there is that large number of individuals who are neither neurasthenic nor psychasthenic, but who have a type of mental and emotional make-up that renders them prey to obsessive states of mind, and who, though not invalids in the strict sense of the word, are often in greater need of the physician's services than one who is frankly ill. Of this class is one, who constantly questioning his decisions, hesitates in conforming his conduct to it after he has made up his mind. He not only looks before he leaps, but lingers, and often lapses. Also one who takes some incident of the past, often of comparative triviality, but which permitted some latitude of conduct or display of judgment, and maintains that it—the conduct or judgment—has been prejudicial to others' welfare and detrimental to himself. He dwells upon this until it loses all proportion prospectively and retrospectively to other and important incidents in his life. Such is one who finds it difficult to realize that the Lord and the Law are satisfied with one's best, and who will not understand that what is one's best yesterday is not his best today. He debates with himself the effect of certain actions or course of conduct upon himself and upon others. On having done an act even the simplest, he begins to feel and display concern that it has not been done properly and adequately. He feels impelled to do it again, and so on through a long list of doubts which embrace every modality of conduct. Many individuals have some one or more of these in a rudimentary way who are in no way psychasthenics, neurasthenics, or hysterics, and this is the point that I wish particularly to emphasize. They are neuropaths or deviates to use the appropriate word which carries with it neither obloquy nor opproprium which was suggested by G. L. Walton, one of the soundest writers upon this subject, but they are not sufferers from a psychosis or neurosis of degeneracy. These distressing and hampering qualities of mind to which I have been referring are conditioned in part by inheritancy and in part by bringing up. I am willing to admit they are conditioned entirely by inheritancy, but proper bringing up can eradicate or overcome them. The rules of conduct applicable to the phelegmatic, the careless and normal are not applicable to the nervous symptoms and deviate child, and maxims embodying such rules are often most pernicious to the latter. The importance of eradicating obsessive states of mind before the individual's character is developed and set is self-evident, for it must be done by substituting legitimate, logical, mental process or thought for errant, obsessive states of mind. Paternal and pedagogical coöperation along these lines would diminish the sum total of misery in the world and curtail the number of neurasthenics and psychasthenics.

THE PATHOGENESIS AND TREATMENT OF NEURASTHENIA IN THE YOUNG.

By Robert N. Willson, M.D.,

OF PHILADELPHIA.

It is a bold man that dares do more than hazard a theory to explain even a given phase of this oldest complex of symptoms—neurasthenia. The vast majority of medical men leave it grimly alone. Clifford Allbutt says of it: "As insanity and epilepsy, so neurasthenia had, no doubt, its sphere in all ages." Certainly today, if we are to judge from our books and the current teaching, medical men are no nearer an understanding of a definite pathogenesis for the condition than were the ancients, who observed it almost as intelligently as we.

"Overwork, nervous exhaustion," is the hue and cry! Allbutt replies, "Neurasthenia is found no more in the busy citizen than in idle damsels," and every student of the subject is forced to acknowledge that he speaks truly. In so doing we contravene the popular impression and bid them cast from them that most heartily welcomed of all the many theories proposed, namely, nerve-stress and nerve-tire. I wish rather to indicate the general lowering of tissue *nourishment* as the primary process, and the upbuilding of this function as the means of cure. Nerve-tire I believe to be simply a symptom, or a result, and still more remote should be the emphasis upon the signs of nerve-tire. This lowering of tissue nourishment may be dependent upon one cause or another, and only a part of the picture is the lowered nutrition of central and peripheral nerve tissue.

It is the object of this paper, therefore, to direct attention to the fact that, at least in the young, every instance of so-called neurasthenia is in the beginning the result of some definite, preventable, and discoverable cause, which if removed in time will admit of a cure of the patient. In one type there may be found a given influence, in another one entirely dissimilar, and in a third and fourth others bearing no resemblance to either of the foregoing; and so almost *ad infinitum.* Whatever the type, cerebral, cerebrospinal, sexual, gastric, or circulatory, there is always a definite, conquerable factor that is allowed to acquire control of a mind and body that should never have been yielded up to its power.

The following four instances of so-called neurasthenia in the young were referred to me by physicians who had in each case treated the nervous symptoms and failed of cure. In each of the four a detailed study was impracticable for the home physician, owing to circumstances of environment or equipment. In each a definite, influential factor was determined, which, when removed, left the way open to a recovery, which has been accomplished in every case. As usual there will be noted cardinal features common to the four. Each furnished, however, as distinct and separate a picture as though related to the others only by cousinship, as it were. As regards the causal conditions, it will be seen that certain influences were at work in the entire series, while each and every patient had given way under a cross peculiarly his own. All were from refined surroundings, and three enjoyed every comfort that money could buy.

Case I occurred in a boy of eighteen years, who inherited a distinctly neurotic tendency on both his father's and mother's sides. He had had none of the child's diseases, never typhoid fever, rheumatism, or a venereal infection, and, so far as could be determined, had never masturbated since first taught the practice at about thirteen years of age. He was brought to me on September 18, 1905, with the history of a fall four years before, following which (in his own terms) "his back troubled him constantly; no real pain, it simply ached; he felt exhausted; could not walk; seminal discharges began and occurred almost nightly; felt he was morally weak, not bad; all this continued to summer of 1904, when he went to the Adirondacks and improved slightly; then went to an outdoor nursery garden, and rapidly became worse, weaker, listless, tossed and turned at night, seemed to friends to be nervously exhausted; on return a month or two later could not fix his attention; to try made him sick for a day;

had emissions day and night, sometimes of fluid, sometimes merely the sensation; discriminated between ordinary and 'nervous' emissions; was sent to Asheville in May, 1905, to his uncle's, where he gained at once and seemed to be getting well; was there six weeks, when his eyes began to fail, hurt him, etc.; eyes then examined by an oculist, who found he could not see to read; returned home in June, 1905, at which time eyes were again examined and only a slight astigmatism was found. Was then examined by two physicians in this city, who had merely one opportunity to study him, and advised him to lead an outdoor life."

The father added the following data: He had just brought the boy from the South, and in order to get him to come had to lift him like a meal-bag and dump him in the bottom of the buggy and drive to the station; then lift him into the train. During the last month he has complained of hot flushes, has been very constipated, eyes distress him, he constantly presses his fingers against nose and lips to relieve the eyes, lids painful, some secretion, much worse after emission, no pain in his back for months, nor pain anywhere, but uncomfortable everywhere; once had an infantile hernia, and wore a truss therefor; testicle was pressed out of place by truss and disappeared; came down only a year ago, and is now very small. A few weeks before reaching Philadelphia the boy had gone to the country, weak and without interest. Suddenly, one day he was found in bed, pale, still, everyone thought he was dead. Dr. Hiram Woods, of Baltimore, saw him on this occasion and brought him down to supper. Father then brought him in the buggy, thirty-two miles, to the station. The urine and the blood had never been examined. When seen in my office the patient appeared to be a pale, thin, very tall and broad boy, looked me fully in the eye for a second, then dropped eyes to the floor. Sat with head in hands, eyes on floor, when allowed to do so. Skin pale, but hands warm; pulse, 100. The only abnormality in the mouth consisted of the two raw stumps of the tonsils, which had been excised by Dr. Ziegler three days before. Marked pulsation in the carotids. Chest poorly developed, round-shouldered, droops the right shoulder, marked depression in the anterior right thorax near the sternum. No signs of pulmonary involvement, except for failure of extreme right apex to expand, and of the breath sounds to enter apex except on forced effort. Slight abnormal curvature in dorsal and lumbar spine. The heart was dilated, the rhythm perfect, the action irritable and angry, and a suspicion of a systolic blow in the apical region. The abdomen was negative. The pupils were dilated, the reflexes of the eyes were present, though sluggish. All other reflexes were normal. The right testicle was very tiny and quite soft, the left testicle normal. Weighed 125 pounds. Malarial plasmodia were found in the blood, of which the hemoglobin reading was 64 per cent.

At this time (September, 1905) the mental condition of the boy was decidedly abnormal. He could not be persuaded to help himself in any way. Could not sleep at night because he heard a buzzing in his room. His father, after an hour's search, found a fly caught in a spiderweb, far across the room, whose struggles no one else could hear. He wanted always to be alone, sat with his eyes on the ground, and asked only that he be not bothered. He admitted, with tears in his eyes, that he wanted to get well, and that he was ashamed of his mental and moral condition, but had given up hope, and could see no use in trying further. He agreed, after some persuasion, to obey orders, however, and on this basis I agreed (with the boy, of course) to take charge of him.

From this time until February, 1906, I guided his entire day, having with him at all times someone who would see that he was kept continually under supervision, whether sleeping or waking, and directing that the main effort should be bent toward tiring him by physical exercise in the fresh air morning and afternoon, with rest between in large doses. At first he was able to do little, owing to his cardiac dilatation. Surprisingly soon he was showing a gain in endurance, and with steady improvement of the cardiac action. I then drove him, often with tears in his eyes, to his work, which otherwise he would not do, except when reminded of his promise to obey every instruction. He protested that it was physically impossible, and I forced him to demonstrate that it was possible. Daily I spent one hour with him in the gymnasium with the windows open wide in the middle of winter, and did first what I wished him to do. He began with one egg and a glass of milk as his only food in the day, and in three months was using six eggs and two quarts of milk daily, besides three full meals. Every remnant of food was cleared from the system by artificial means before the first meal of the next day, whether the bowels had moved naturally or not. Bathing, clothes, and mental training were all directed by the day, every move being explained to him, and my office being open to him for a visit whenever he could find me to ask a question. In short, I carried the boy mentally, morally, and physically for six months, and during the last three had the pleasure of seeing him begin and gradually assume charge of himself.

For the past six months he has been at school, has weathered a severe bronchopneumonia and is again well, has nearly regained the twenty-five pounds that he had added under our *regime* (weighing 150 pounds before his pneumonia), and has just determined for himself during the last week that his mind is at last clear, and that he "can now will and do what he wants," and is to all intents and purposes a well man. He had never had delusions, but he had been as nearly without initiative or power of mentality as I have ever seen a human being that was not insane; and today he has it in his own hands, I believe, to say whether he shall retain his mental and physical vigor, under Providence, of course, or whether he shall allow mind to follow body back into the slough of despond. The only medicines used during the course of treatment were, in the beginning, quinine and iron, such as would control the seminal emissions, and later cardiac tonics. His eyes have been pronounced normal by Dr. de Schweinitz, and he has even discarded the glasses which he had believed the only hope of cure, and does his work at an advanced boarding school along with a class of healthy boys. About the middle of his course of treatment Dr. Ziegler cauterized the erectile tissue in both nasal cavities.

Case II was one of a young woman whom I had known from childhood, and who was referred to me by Dr. Edward Martin. On both sides she inherited a strong neurotic tendency. One brother and two sisters living, all high-strung and sensitive. Father had severe headaches in youth, and patient has same affliction. The attacks take the form of an almost typical migraine, with nausea and often vomiting prior to relief. She has a slight curvature of the spine, once had an abscess of the middle ear, has had malaria, and also two seemingly authenticated attacks of typhoid fever, the last four years ago. Has had influenza several times. Took the rest cure under a Philadelphia neurologist five years ago, and was in bed two months. A number of years ago was under the care of a woman physician here, who corrected a retroflexion of the uterus, causing her to wear a pessary. Has never felt well in life. Always worries, and tires easily with mental and physical effort. Menses always irregular, leaving her completely prostrated. Always a "bilious" color. Pressure from her clothing seems constant; occasional palpitation of the heart. Admits that she eats too much, drinks coffee twice daily. Has involuntary sexual dreams and sexual excitement very frequently in the early morning. Has masturbated very frequently for years, and still continues the practice. Is much depressed, and very discouraged over the failure of her physicians to cure her. Says I am the "last physician she shall ever allow to make a fool of her."

She came to me on January 25, 1906, at which time she was pale, sallow, her lips almost blue, and her nose, hands, feet, all cold and clammy. Breath foul. Arteries soft and normal. The cardiac action was rapid (90), the second pulmonic sound everywhere accentuated, also less so the second aortic sound; there were no murmurs. The right pulmonary apex showed a slight catarrhal involvement, the left lung was negative. The spinal curvature was very marked to right and left (spiral). No tender areas in spinal column. No areas of anesthesia over body. No hysterical stigmata. Reflexes slightly increased. Both plantar arches completely broken down. The hemoglobin read 70 per cent., the red blood cells 2,928,000, the leukocytes 3400. No malarial plasmodia. The urine and the stools showed nothing abnormal, no parasites, and no ova. The right kidney was freely movable, enlarged, and very tender to palpation. The remainder of the abdomen was negative. The mental condition was strikingly gloomy, and the patient seemed to wish to die, considering her existence a burden upon others and herself of no advantage to anyone.

A schedule in the main similar to that of Case I, though by no means so strenuous, was outlined and the patient's firm promise secured that it would be followed to the letter. Repeatedly, however, she came to my office merely to say that she was not fulfilling her promise, especially with regard to self-abuse and exercise in the open air. The program was started afresh each time and the patient treated much like a young child through the greater portion of three months, when she began to show a marked change for the better, not only in appearance but in confidence in her ability to do and to be of use. From that time until now there have been frequent lapses, even the habit of masturbation not having been thoroughly mastered. The patient is now, however, the centre and mainstay of the family, and as happy in her certain recovery, which she is helping to bring about, as any little child over a toy, or a conqueror over a battle won. The only drugs used were iron, strychnine, and laxatives, the former two only in the beginning.

Case III resembled Case I in everything except the degree of mental and physical depression. He also was a young man, about twenty-eight years of age; on his mother's side of intensely neurotic stock. He was sent to me after he had gone the round of the sanitaria for the rest cure. He was in a mental depression so profound that, like Case I, he lacked only the delusions to warrant the diagnosis of melancholia. He had held, and again fills, an important position at the head of a department of a large factory in this city, carrying much responsibility. For three years he had overworked at high pressure. He was sent to me on May 20, 1906, with the history of severe attacks of all the diseases of childhood in early years, even scarlet fever, and recovery from all. Since childhood he had been healthy, and engaged in athletics until three years ago, when "he began to realize he was sick." He was worried over little things, he tired easily, his eyes began to trouble him, he was constipated, his feet and hands were always cold, and seminal emissions were becoming more and more frequent, each one leaving him depressed for the day. Very depressed mentally. Had consulted a number of physicians, and had just returned from several months spent at a sanitarium at Wernersville. Had gained a little in weight, but was worse than ever mentally, and "almost feels that he cannot get well."

When examined by me on May 20, 1906, he was thin, bleached, hands cold and clammy, mucous membranes all pale, pulse fairly good (90). The heart sounds clear, the second sounds both accentuated, no murmurs, no arrhythmia. The abdomen was absolutely negative. The lungs showed no abnormality. The pupils were dilated. All reflexes were present, and the tendon reflexes slightly exaggerated. His mental condition was pitiful. As he sat in the office during the examination he appeared like a frightened animal, and at the conclusion of my examination he said he "supposed there was no hope for him." I met him on the same day in the gymnasium and inaugurated a *regime* very similar to that of Case I, and with identical results, first confidence and later ability, both following hard after physical tone.

Three times after I thought him safe he came back to me with the statement that he had lost all his gain. A week of the same rigid discipline started him on his way again each time, and when I now see him, as I often do, he can laugh about his nightmare, feeling safe that he is master of himself and no longer in dread.

Case IV, a man in his thirty-ninth year, furnished an example of sexual neurasthenia of such an aggravated type that he seemed hopeless not only to himself, but to me. While not insane in all that the word implies, he was thoroughly insane on the subject of sexual license. He looked on woman as an animal made simply for the sexual relief of man, and had practised this doctrine during several years to the extent of a number of excesses daily, both by masturbation and illicit intercourse, interspersed with natural intercourse with his wife on not infrequent occasions. He did not boast of this record, but he was in no way ashamed of it. As a curious paradox, he made it very plain that he desired to be freed from the belief that sexual excitement was the only enjoyment of value in life, also his determination to find a physician who would "not simply absorb his few remaining dollars," but in return therefor inform him to his satisfaction whether he could become like other men (in sexual matters), or whether he must be looked on as a shame and a reproach to the end of his days. He recognized the attitude of the world toward his idiosyncrasy, and, for the sake of public opinion merely, desired to become other than his perfectly satisfied and beatified sexual self.

He had always been well as a child until he fell "straddle" and injured himself. A little later he began to masturbate, and continued this practice two or three times daily. Then he was advised by a physician to adopt illicit intercourse. He contracted gonorrhœa, and during same had a swollen, painful knee. Had no venereal infection since, but had, and up to the time of my examination on June 15, 1905, still continued to have a constant erotic desire. Would have intercourse with four women in one night, and yet was not sexually quieted. Beginning to feel weak in the loins. Pains in joints, and all muscles tired. When he had typical seminal discharge, said that there was a great quantity of semen and also a cylinder or rod of crystal, gelatin-like material. Had been to prominent specialists in New York and Baltimore, and was invariably told that he had better let well enough alone, and that they could do nothing for him.

I found him in pain all over his body. Constant smarting on micturition. Fulness in the prostatic region. No urethral discharge. Weak, and too flaccid in mind and body to leave the office when he had no more to say and I had opened the door for him. Seemed stupid and as if under the influence of a drug.

His physical examination was absolutely negative, apart from his circulatory apparatus. His hands were cold and cyanotic, and accentuated second aortic and pulmonic sounds accompanied a feeble cardiac action. The urethra admitted easily a No. 30 French sound. There was induration of the epididymus on both sides.

This patient also was placed under strict supervision and his day mapped out for him as far as possible. At my request, Dr. Ziegler cauterized the erectile tissue in both nasal passages. Only a part of the regulations were ever carried out by the patient, but enough was done to enable him to gain a start toward mental health at least. He was able to return to his work as a druggist, has regained a considerable amount of physical vigor, pretends at least to respect the rights of women, and is restraining the tendency to sexual delirium to some extent. He has proved to himself and to me that he can finish the work as soon as he will altogether do away with the daily sexual excitement. Whether he has gone too far in moral depravity for a cure on the simple basis of physical improvement is still only a matter of conjecture. At present the least one can say is, that his marked neurasthenia has disappeared, and that he is within sight of healthy manhood. Recently I learned that he was "better than he had ever expected to be, but not altogether there yet."

The narration of these cases speaks for itself, and little comment need be made. My object, fully explained to each patient, was to win his or her personal confidence; then to educate the physical body to do more than it had ever done in the way of attaining perfect tone, feeling certain that mind and nervous system would follow the body in regaining control and balance. I fed each to the limit at regular intervals, but made sure that every gram of food was burned up by exercise in the fresh air. As imperative as any one measure was the thorough, always artificial morning evacuation of the digestive tract. Physical tire was accomplished morning and evening, and real tire, never exhaustion, marked the limit of this feature of the program. As the muscles grew hard and the "second wind" began to appear, the depression and the neurasthenia seemed to lessen, until, as I have shown, the patient became convinced of the improvement and the possibility of cure. This self-confidence in a real, even if only a minimal, gain appeared in each case to be the beginning of the actual advance. This point won, the patient would begin to shoulder his own load, and the task become an easy one for me.

It may be objected that not every physician can afford the time for the handling of such a case. I certainly could not, and many a time wished that the patient belonged to someone else. I have none the less accepted four such in a year's time, each reaching me as the outcome of the one preceding. I do not believe a physician, with the knowledge that he can cure, has the moral right to refuse. The patient must be made to pay for the time and for the cure, and the handling of such a case deserves a large fee. The great satisfaction of seeing the recovery of a physical and mental degenerate pronounced hopeless by doctors and friends alike is spur enough for any man, and may act more forcibly even than the prospect of filling the exchequer. No class of cases will give such a moral return.

Each of the cases cited had been treated before coming to me according to the regulation plan, rested, electrified, massaged, and overfed, and each was nearing the borderline between neurasthenia and confirmed insanity. In this class of cases internists and neurologists teach that we must not coerce the patient. One distinguished regius professor says that "a neurasthenic is usually made worse by a determined effort to fight against the disability," as contrasted with hysteria, in which such efforts are beneficial. The great majority of the students of the nervous specialties sympathize with this view. At a meeting of surgeons and gynecologists, held about a year ago, into which I strayed as a lamb among wolves, I heard a discussion of the subject, "Neurasthenia Complicating Gynecological Conditions." The entire trend (aside from the question of operating or not operating, with regard to which there were as many opinions as gynecologists present) was in the line of emphasizing the need of rest and overfeeding, in the vain hope of cure. One daring soul scandalized the meeting by suggesting the "horsewhip and forcible propulsion into the open air" for every neurasthenic woman. Pandemonium ensued as the outraged exponents of the rest cure wrestled for an opportunity to reply. None the less, this same physician and gynecologist (for by his remarks he proved himself to be both) was asserting in an overstrenuous way a fact which he had tested in actual cases, in which the method had brought him success where others had failed. The horsewhip was, of course, a figure. The idea was as sane as the result was perfect, and I wished for the opportunity to say that I had already learned that the principle was well grounded on fact and reason. Only the consternation of the meeting and the sudden adjournment prevented the raising of a purely medical voice to endorse and reassert the claim.

This principle outlines and determines pathogenesis and cure. Call neurasthenia what one will, or call what one will neurasthenia, the fact remains that it is not even a complete symptom complex, merely a portion of one, that is founded essentially upon a lowered nutrition of not only the nervous system, but of one and all of the tissues and systems of the body, the circulatory system, the bony system, the muscular system, the nervous system *also*, and above all upon altered and diminished food properties of the blood and lymph. The demonstration of the truth of this assertion can be accomplished in any case that has not passed over the boundary between neurasthenia so-called and genuine insanity, and even in the early stages of the latter, as Case I would appear to show. The application of the truth requires personality and patience.

Reasoning backward, it would seem more and more probable, if normal conditions and health can be regained by the employment of active hygiene, embracing every measure possibly included in the term, and by hygiene administered against the patient's desire and by muscular force when necessary; if, I say, this be true, and I believe it to be a fundamental truth, then it would seem fair to conclude that neurasthenia is a misnomer and "hygiene hunger" the proper term. In one nerve exhaustion, in another trauma, in the next sexual excess, in a fourth that auto-intoxication peculiar to the disposition which Shakespeare characterizes when he speaks of those whose "fat blood slips lazily along their veins," in a sixth or seventh malaria or chlorosis, or overexertion of mind or body during rapid growth and development—any of these may underlie and cause, if you please, the symptom-complex that we have been content to denominate neurasthenia. Rest one, exercise another to the limit, feed those who need food, and starve the overgreedy; in every case provide a change of daily *regime,* overdose with clean water and clean air inside and out; and the time will arrive for everyone in which graduated exercise in the open air to the point of physical tire will begin to be possible and will serve as the road to health of mind and body.

Perhaps in the results that shall be obtained the physician will enjoy a renewed confidence in the justification of his existence, while the surgeon will sadly witness the reclaim of a wide range of purely medical conditions which he had dreamed might become his eminent domain.

NERVOUS MANIFESTATIONS OF ARTERIOSCLEROSIS.

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Various nervous symptoms may be met with in cases of arteriosclerosis, some of them being certainly the result of the vascular disease, while others are due to associated organic diseases. It must be recalled that persons suffering from arteriosclerosis usually have some form of structural disease affecting the kidneys, heart, brain, or other organs, or several of these at once, and it is important to distinguish the symptoms caused by such associated conditions from those which are properly attributable to the arteriosclerosis as such. In a certain sense the nervous manifestations resulting from secondary organic diseases are, of course, assignable to the vascular disease that caused the organic trouble; but it is necessary to differentiate as far as may be possible between symptoms that result directly from the arteriosclerosis and those which have some intermediate organic derangement for their cause. More especially is it necessary to avoid the error, perhaps a little too likely to become prevalent, of attributing to arteriosclerosis, various symptoms that arise as a result of purely accidental organic diseases associated with the vascular trouble but not essentially due to it. The same difficulty occurs here as has happened in the past in the cases of such general conditions as neurasthenia, hysteria, anemia, etc. It is easy to acquire the habit of regarding all sorts of symptoms as the result of such conditions and of overlooking associated diseases. The danger is even greater in the case of arteriosclerosis, which is so nearly universal among the aged that the indolent diagnostician may readily fall into the way of attributing all of the generalized and more or less obscure conditions of senility and even of the presenile period to arteriosclerosis. For these reasons I shall take pains in the following discussion to point out, first, the certain results of vascular occlusion or disease, and, second, the symptoms associated with cases of arteriosclerosis that may be fairly attributable to that condition by reason of their analogy with the symptoms included in the first group and by the exclusion of other probable causes. Increase of knowledge may hereafter establish more accurate methods of determining the relationship of certain symptoms to disease of the bloodvessels and their occlusion, but for the present we must rely upon the plan suggested.

SYMPTOMS ASSOCIATED WITH OBSTRUCTION OF PERIPHERAL VESSELS. The sudden occlusion or obstruction of one of the larger peripheral arteries is attended with immediate and usually quite characteristic symptoms. This may be observed when a larger artery is compressed with the fingers or a tourniquet, or when obstruction is caused by a large embolus from the heart or aorta There is sudden pain, often excessively violent in character, and generally loss of power in the parts supplied by the obstructed vessel. The pain may subside in a short time, to be renewed with secondary embolisms farther toward the periphery, or with increase of the direct compression; but later the violence of the pain is lessened, and nstead of intolerable suffering a more continuous aching follows or the patient complains of darting pains of relatively moderate intensity extending from the place of obstruction to the extremity of the affected member. The loss of power is rarely complete and becomes less marked after the initial violence of the attack has subsided. In some instances, however, the paralysis is absolute. Thus, in cases of total obstruction of the abdominal aorta by an embolus there may be sudden and complete paraplegia, besides intense pains in the legs of the character just described. In addition to the two predominating symptoms, pain and loss of power, there are a number of others of a less conspicuous kind. Among these are pallor, coldness (objective and sometimes subjective), tingling or numbness, weakness or complete cessation of the pulses in the peripheral vessels, occasionally violent cramps of muscles, and sometimes lividity or edema. The tendency to cramps or muscular spasm was illustrated by the violent intestinal spasms produced in Thoma's experimental compression of the abdominal aorta. The other symptoms, more or less pronounced in severity, have been repeatedly caused by experimental compression of peripheral vessels and by embolism. Eventually the result of complete occlusion of a large artery is recovery by establishment of a collateral circulation or gangrene.

The following cases illustrate the direct association of pain, loss of power, etc., with occlusion of the main artery of a limb:

J. W., aged seventy years, had advanced general arteriosclerosis and myocarditis. He had two attacks of embolism, or more likely cerebral hemorrhage, each, rather remarkably, affecting the cuneus region. After the first there was hemianopsia, after the second nearly complete blindness. Finally, in June, 1907, there occurred a sudden embolic occlusion of the right external iliac or femoral artery, attended with such intense pain that the patient, though semi-unconscious, cried out in agony, and could be only partially relieved by large doses of morphine. The right leg became motionless at once, and subsequently recovered very little power. The posterior tibial and dorsalis pedis pulses could not be felt; the feet and later the whole leg grew pallid and cold. Two days later a similar attack occurred in the left leg and caused paralysis of the left leg, almost completing a paraplegia. Fortunately the patient did not long survive the development of these intolerable conditions, for the pain, though less marked than in the beginning, did not wholly subside, and every attempt to move the legs caused intense suffering and spasmodic contraction of the muscles. There were numbness and anesthesia of the skin, and before death necrosis of the heels and toes had begun.

A. V., aged fifty years, had an embolic obstruction of the femoral artery while walking. There was sudden pain in the back of the thigh, and the patient cried out, thinking that someone had struck him across the thigh with a stout cane. He turned round to see who had done so, when the power in the leg failed and he fell to the ground. This case is of interest because of the character of the pain complained of. In several instances within my knowledge the patient has expressed the same feeling of having been struck.

Painful Sensations Preceding Senile and Diabetic Gangrene. In these conditions vascular obstruction is less immediate and less complete than in the group just described, but it is unnecessary to offer proof of the well-established fact that the gangrene of diabetics and senile arteriosclerotics is preceded by gradually increasing obstruction of the arteries. Neither is it necessary to describe in this place the various symptoms, such as coldness, numbness, tingling, darting pains, and finally the intolerable suffering that accompany the conditions. It is, however, important to consider whether these various symptoms are directly attributable to the vascular obstruction or rather to some associated condition. Kussmaul and later Joffroy and Achard have described cases of neuritis which they regarded as resulting from arteriosclerosis. While this possibility is less applicable to the suddenly developed pains attending the onset of senile and diabetic gangrene than to the more gradual conditions to be described in the next group, it may be mentioned here as a suggested explanation of certain painful conditions associated with arteriosclerotic occlusion of the circulation In view, however, of the sudden intense pain of embolic or experimental obstruction, and of the continuing darting pains following the more severe onset, it may be doubted whether the intervention of a neuritis is a frequent, not to mention a necessary, condition.

In the same group as the cases of gangrene may be placed cases of intense cardiac pain due to occlusions of the coronary arteries. It is a well-known fact that in many cases of angina pectoris embolic or thrombotic occlusions of the coronary arteries and degenerative lesions of the myocardium are encountered, and it has been believed by some that the attacks themselves may be the immediate result of such sudden occlusions. In proof of this view cases have been reported in which after a very severe attack of angina leading to sudden death recent embolism or rapidly developed thrombosis of the coronary vessels has been discovered. It is not my intention here to suggest that such vascular occlusion explains all cases of angina pectoris, but it seems fairly certain that some of the cases of intense cardiac pain leading to a fatal termination have this causation. It may be well to recall in the same connection the intense pain sometimes met with in the back in cases of renal embolism and the similar pains found in the region of the spleen upon the development of a sudden splenic infarction.

Pains and other Nervous Symptoms in the Extremities less Certainly Attributable to Arteriosclerosis. A variety of nervous symptoms, including numbness, tingling, a sense of coldness or of heat or burning, and other forms of paresthesia (acroparesthesia), and sometimes moderate or severe pain, together with a sense of stiffness, and perhaps actual stiffness or weakness, occur in persons of advancing years with more or less arteriosclerosis. These symptoms more frequently affect the legs than the arms, although the paresthesia is not infrequent in the hands. The severity of the manifestations may have a direct relation to the degree of arteriosclerosis, and may increase in direct proportion with the advance of that disease. In other cases it may be observed that the symptoms increase and decrease as the condition of the heart suffices or fails to maintain the circulation in the sclerotic vascular system. As patients presenting these symptoms usually have other disorders in addition to arteriosclerosis, it may sometimes be doubted whether the nervous manifestations referred to are the result of the disease of the bloodvessels or of other (associated) conditions. The fact that the further progress of such cases shows only an increase in arteriosclerosis and its undoubted consequences, and not more pronounced local or general manifestations of other diseases, is rather convincing that the symptoms may be properly attributed to the vascular disease. Two cases of this sort may be very briefly cited:

J. R., aged seventy-two years, a highly arteriosclerotic man with associated cardiac hypertrophy, has suffered for some time with what he calls neuritis in his legs. There is tingling, burning, and pain in both legs, but principally in the right, from the knees to the ends of the toes. The pains are indefinite in location and cannot be increased by pressure along any of the nerve trunks. There is general weakness of the legs, but no definite palsy. The feet are cold, and at times become livid in spots. When his circulation is improved by the use of digitalis, strophanthus, and glonoin the pains decrease and in general his suffering is directly proportioned to his condition and especially the state of his circulation.

Mrs. R. S., aged sixty years, is markedly arteriosclerotic and has some gouty change in the joints of the hands. For several years she has complained of constant numbness and painful tingling in the fingers. To a less extent the feet have been similarly affected. There have never been acute gouty attacks. She has had no definite indications of neuritis.

In both of these cases the question may be properly raised whether or not the symptoms are the result of neuritis. The possible occurrence of an arteriosclerotic form of neuritis has already been alluded to, while in the second of the two cited cases another possibility, that of gouty neuritis, presents itself. In the first case the intensity of the symptoms has been so directly proportioned to the adequacy or inadequacy of the circulation that there has seemed little doubt about the directness of the association. In the other case, and this is but one of a number of similar type, one should perhaps be less certain of the relationship.

Allusion may now be made to a large group of more or less painful affections of the extremities associated with arterial disease in which the symptoms suggest the intervention of reflex vasomotor conditions between the arteriosclerosis and the acute manifestations. Among these affections are erythromelalgia, Raynaud's disease, "dead fingers," and intermittent claudication. All of these conditions occur in persons who have more or less decided arterial disease. In the first three the nature of the attacks and the paroxysmal character of the vasomotor phenomena suggest that reflex nervous influences play an important part in the phenomena, but the association of marked arteriosclerosis and the constantly recurring circulatory disturbances suggest that the reflexes have their origin in the arterial disease. So far as intermittent claudication is concerned, this peculiar syndrome has been generally accepted as due to arteriosclerosis since Charcot's original communication and Erb's more extensive studies. The symptoms do not differ greatly from those first referred to in this group, but the pains, paresthesia, stiffness, cramps, and weakness are distinctly the result of effort. It has been assumed by some that these manifestations result directly from the inadequacy of the supply of blood, when the exercise of muscular effort taxes the circulation, while others have thought that vasomotor spasm results from the exertion and causes the symptoms.

It has been pointed out in proof of the first of these views that painful cardiac attacks associated with coronary disease lessen when the myocardium has grown considerably sclerotic and when in consequence the need of active circulation is less imperative than in the case of a more normal heart muscle. Erb and some more recent neurologists have maintained that a nervous element plays a part by exciting vasomotor spasm, and in proof of this cite the facts that coldness, pallor, and weakness of the pulses are frequent symptoms of the attacks, and that claudication is especially likely to affect arteriosclerotic persons who have a general neurasthenic condition as well. On the other hand, it is significant of the importance of the purely obstructive character of the vascular trouble that claudication has been universally recognized, since Charcot's description, as a forerunner of gangrene.

Dejerine, Sollier, and others have described cases of intermittent claudication in which the symptoms have been practically the same as those usually recognized, but with the distinctions that the signs of peripheral arteriosclerosis (coldness, weakness of pulse, etc.) have been wanting and the knee-jerks have been normal or absent during rest and excited after exertion. In these cases there was found arteriosclerosis of the spinal vessels, and Dejerine attributes the symptoms to anemia of the cord. The following case resembles Dejerine's variety in the behavior of the reflexes, but there was a very decided arteriosclerosis of the peripheral vessels:

L. H., aged fifty-three years, height six feet, first consulted me about eight years ago, when he had chronic pharyngitis and beginning deafness which was found to be due to middle ear disease. Even at that date he complained of a peculiar form of weakness in the legs after exertion. He was admitted to the University Hospital seven years later with more marked symptoms, which then took the form of rather distinct claudication. After every exertion he suffered with weakness, cramps, and pains in the legs, and his general condition was one of increasing debility. He had arteriosclerosis of a decided grade involving the arteries in a uniform degree, and there was also distinct sclerosis of the peripheral veins. His station was slightly ataxic and the gait was somewhat shuffling, but after exertion, as in walking, he became notably weak in his legs, so that he could scarcely stand erect, and he complained of a sense of stiffness in his muscles. There were constant vague, indefinite pains in the legs, but no alteration in thermal or tactile sensation. The knee-jerks were usually absent, even on reinforcement, but after exertion or when under slight excitement the patellar reflex was present and sometimes actually exaggerated. He remained under observation for several months, growing more feeble as time went on, and finally became bed-ridden. His heart, which was a little hypertrophied and evidently deficient in power, failed, and finally, after a fall, he developed gangrene of one arm and died. The symptoms were those of intermittent claudication excited by exertion, but there was the possibility of a central (spinal) lesion suggested by the usual absence of patellar reflexes and by a tendency to vague sensory disturbances affecting the body in the region of the hips. My colleague, Dr. Spiller, inclined to regard the symptoms as sufficient to suggest a spinal lesion, but my own observations led me to believe that the condition was mainly, if not wholly, peripheral. We both agreed that the arteriosclerosis, whether operative peripherally or partly centrally as well, was the fundamental cause of the peculiar nervous manifestations in the legs.

In some cases the muscular stiffness and pain occur under precisely opposite conditions. In these instances, after sitting or otherwise resting, the patient finds, on attempting to rise to his feet or to walk, that the muscles have become stiff and painful and exertion is attended with more or less suffering. While in minor grades a common symptom in old people, this association occasionally reaches such a marked degree that it constitutes a clinical condition of much importance.

The diagnosis of this peripheral condition is sometimes extremely difficult, particularly in instances in which pains radiating through the limb suggest the existence of a neuritis. A number of such that have come under my observation have been so regarded. Among the distinctions which have impressed me as important are the absence of tenderness along the course of the nerves, the absence of anesthesia, and the presence and more or less proportionate grade of arteriosclerosis associated with the conditions.

ABDOMINAL PAINS IN ASSOCIATION WITH ARTERIOSCLEROSIS. Sudden obstruction of the abdominal aorta by a large embolus from the heart is known to produce intense pain; aneurysms of the abdominal aorta also occasion marked and often excessive pain; but there are conditions in which less serious disease of the abdominal aorta or other abdominal arteries may occasion painful conditions in the abdomen. It is not, I think, sufficiently recognized that a tortuous sclerotic abdominal aorta or a simple pulsating abdominal aorta when slightly sclerosed may occasion intense paroxysms of pain. Some of the cases of continuous backache in old people have impressed me as belonging to this group. In these it is difficult to prove the cause of the pain, but in some others intense tenderness of the violently throbbing aorta in an emaciated person in whom the vessel can be palpated indicates the direct relationship between the vascular trouble and the clinical condition Furthermore, the association of pain with atheroma of the thoracic aorta furnishes an analogy that is of some significance.

Pains in Arteriosclerosis of the Thoracic Aorta. Not rarely in individuals with marked sclerosis of the arch of the aorta painful paroxysms occur upon slight exertion. In some instances these have the definite paroxysmal character of angina pectoris, even though the coronary vessels have not been involved Usually, however, the pain is more diffuse, extending almost equally to the right as well as to the left shoulder or arm, and the relation of the attack to muscular effort is a closer one than in angina from disease of the coronary vessels. It has been suggested that sensory end-organs (Pacinian corpuscles) in the wall of the aorta explain the tendency to these phenomena.

Cerebral Manifestations of Arteriosclerosis. The direct relation of arteriosclerosis of the cerebral vessels to cerebral hemorrhage and thrombosis needs no discussion, but it may be well to consider here the possibility that many rather indefinite cerebral manifestations in persons suffering from arteriosclerosis may be the result of (partial not completely obstructive) thrombosis of larger cerebral vessels or of complete thrombosis of finer branches. Lesions of this sort are apt to be overlooked even by the pathologist unless his attention is directed especially to this point. The studies of MacCallum have shown how hyaline thromboses of the smaller cerebral vessels may occasion marked cerebral symptoms in malaria, and similar lesions not infrequently occur in arteriosclerosis. Partial thromboses of the larger cerebral vessels are frequently met with, indeed are rarely completely wanting, in cases of extensive arteriosclerosis of the circle of Willis and of the other cerebral arteries. These thrombi, though not completely obstructive, cause a rather rapid encroachment on the lumen of the vessels, and thus interfere with the circulation in a manner more abrupt and violent than does the narrowing of the lumen that results from increase of the arterial disease itself. It is not unlikely, then, that the symptoms usually attributed to obstruction of the circulation by increasing arteriosclerosis are often the result of such thrombosis. However this may be, the more important fact to establish is that certain cerebral symptoms suggestive of other conditions may be due to arteriosclerosis with or without partial thrombosis.

The influence of obstruction of the cerebral circulation in the development of symptoms is shown by the unequivocal results of complete thrombosis of large cerebral arteries, but even more directly by experimental studies, to which reference may now be made.

EXPERIMENTAL AND PATHOLOGICAL EVIDENCE OF THE INFLUENCE OF OBSTRUCTION OF THE CEREBRAL CIRCULATION IN THE DEVELOPMENT OF CEREBRAL SYMPTOMS. From the days of Avicenna, who caused loss of motion and sensation in animals by ligation of the carotid arteries, to the present time a long line of physiological experimenters have described a group of cerebral symptoms that could be caused by compression or ligature of the carotid vessels. Miller caused, in each of eighteen experiments, disturbed breathing and heart action, depression of temperature, sleepiness, vertigo, blindness, strabismus, spasms, and convulsions. Kussmaul and Tenner, in a more elaborate investigation, confirmed these findings and add results, exactly like those obtained in animals, which they obtained in human beings. They quote the results attained by a number of previous investigators, all of whom caused marked symptoms falling short of actual convulsions, and then cite their own experiments, in which convulsions were readily produced in six rather weak persons.

Naunyn was the first to call attention to the clinical occurrence of convulsions in persons suffering from cerebral arteriosclerosis, and his pupil Lucas[1] collected from the literature seven very striking cases in which convulsions (preceded by less severe nervous manifestations like those mentioned above) occurred in persons of middle or advanced age as the result of occlusion of the carotid arteries by thrombosis or compression by aneurysms and tumors. A study of the history and pathological conditions in these cases leaves little room for doubt that the cerebral symptoms were the direct result of the obstructed circulation. Lucas then reports two cases under the care of Naunyn in which elderly individuals with marked arteriosclerosis suffered from attacks of dizziness, headache, twitching of muscles, and great weakness. In one of the cases compression of the carotid arteries caused the rapid development of an attack in which the symptoms just mentioned, as well as temporary unconsciousness, occurred. The conclusions reached by Naunyn that these epileptiform seizures resulted from the conditions of the cerebral vessels appears to me entirely warranted.

Several cases of this sort have come under my observation, of which the following merit mention:

Mrs. W., aged seventy-eight years, has been under my observation for several years past. She has markedly sclerosed vessels and some hypertrophy of the heart. The kidneys seem reasonably normal.

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[1] Inaug. Diss., Strassburg, 1894.

There are occasionally a trace of albumin and a few hyaline casts, but the conditions do not appear abnormal for one of her years. She has had a cataract in both eyes, one of which was operated upon with entire success three years ago. When she first came under my observation, three years ago, I was informed that for some little time past she had had attacks of peculiar character, often at night and sometimes also during the day. These had been regarded as petit mal. They consisted of momentary loss of consciousness or bewilderment, followed by slight clonic convulsions affecting the arms and legs and not beginning in any particular member, so far as could be discovered, and ending with a period of mental confusion and aphasia lasting from a few minutes to an hour, and ending in a deep sleep from which she awoke to her previous condition. Such attacks had occurred with some regularity for a year or two, when she had during the summer a seizure which appears to me to have been cerebral embolism or thrombosis, and left her with moderate hemiplegia. When I saw her in the following autumn the palsy had to a large extent disappeared. She has since had a number of attacks of the same character. Like the earlier ones, these involve no special part, being quite as likely to occur on the well side as on that which is partly paralyzed.

Mr. A. J. O., aged fifty-five years, had begun to suffer with circulatory disturbances, on account of which he first consulted me three or four years before his death I found an advancing arteriosclerosis, which steadily progressed up to the time of death. About two years before his death, when he was in rather good condition, he was seized with a sudden convulsion while playing at golf and was carried home. I found a slight right-sided hemiplegia, involving the face and arm, which cleared up almost completely within six or eight hours The upper arm alone seemed involved, the power in the fingers and the forearm being more or less completely preserved. After a few days he had no evidence of weakness in the right side. During the followingsummer he had two convulsions while in Europe, and there consulted Marie and other neurologists, all of whom agreed in regarding the convulsions as "functional." After his return to America several other convulsions occurred at intervals of a few months. There was no specific history, and up to the time of his first attack he had never had a lasting albuminuria, though he once or twice had a faint trace of albumin in his urine. After the onset of the paroxysms his general health grew worse and his circulation steadily grew weaker. Toward the end of his life he developed evidences of renal disease, which impressed me as being directly the result of the failing circulation. There was nothing in the paroxysms at any time suggestive of a uremic condition, and after the original one the recovery from the paroxysms was almost immediate, the whole seizure lasting little more than five to ten minutes.

J. T., aged sixty-five years, a patient in the Philadelphia Hospital, had extreme arteriosclerosis and an enlarged but weak heart. The peripheral circulation was very poor. Extremities were usually cold. The patient's general condition was one of marked enfeeblement. The kidneys apparently were not diseased; at most, some senile change could be recognized. Suddenly, without premonition, a convulsive seizure involving the muscles of the right side of the face and neck and of the deltoid and trapezius of the right side developed while I was examining the patient. It was difficult to determine whether there was complete loss of consciousness, on account of the patient's general state, but there was evidently at least a partial unconsciousness. After a duration of about five minutes the attack passed off and the patient regained his previous condition. Subsequently he improved somewhat under rest and care in the ward, and he was discharged from the Hospital.

These three instances represent definite convulsive attacks in arteriosclerotic patients without any other explanation of the seizures. In two of the cases there was very probably thrombosis in at least one of the attacks; but the other attacks seemed to occur without any of the usual evidences of complete occlusion by thrombosis or embolism. In the third case there was but one attack, and this was not discoverably due to thrombosis. In view of the experimental evidence before cited, it may be regarded as established that sudden interference with the circulation, whether due to thrombosis or embolism, or independent of these accidents, may account for seizures such as occurred in the three cases just described. In the cases in which thrombosis or embolism are absent weakness of heart action may be the cause of the suddenly developed inadequacy of the cerebral circulation, while in other cases vasomotor spasm may possibly occur. The last explanation may apply to the seizures attending paroxysms of Stokes-Adams disease.

Stupor and Coma Associated with Cerebral Arteriosclerosis. The cases included under this heading are a little less definitely ascribable to the influence of the arterial disease alone, for the reason that the symptoms are less distinctly paroxysmal, and therefore less certainly the result of a temporarily active cause, such as circulatory disturbance. Nevertheless, in view of the fact that both stupor and coma have been produced experimentally by compression of the carotid arteries, and that in some cases the stupor suddenly appears and as suddenly disappears, the connection of the attacks with circulatory disorder does not seem unlikely. If one studies the symptomatology of extreme senility, there will be found a constantly recurring picture of stuporous states alternating with periods of mental alertness often quite surprising. The aged patient without warning falls into a lethargic or semicomatose state, and may remain so for hours or even days, and not infrequently wakes from this condition suddenly and completely, only to relapse again and again. The cause of these attacks may doubtless be an incomplete uremia in some cases, or other forms of toxemia, but the sudden relief of symptoms that so often occurs has convinced me that the attacks are more usually dependent upon the condition of the cerebral circulation.

Sometimes the attacks occur in persons who have not yet reached the period of advanced senility, and the attacks may be more lasting than those just referred to. In such cases a diagnosis of uremia is very likely to be made. Not a few of the cases of "uremia" occurring in such hospitals as the Philadelphia Hospital, where aged derelicts abound, are I think not actually instances of uremia, but rather cases of coma due to disturbed cerebral circulation the result of arteriosclerosis. One instance of this sort will suffice for illustration:

J. C. A., a man aged sixty years, was admitted to my ward at the Pennsylvania Hospital in complete coma. There was a high grade of arteriosclerosis and extremely feeble heart action. There was no albuminuria at this time nor subsequently while in my care. On two previous occasions he had been treated at the Pennsylvania and another hospital, and had been regarded as uremic. I was impressed with the intense weakness of his circulation and the extreme arterial disease, and advised against any depletive measures or other treatment such as is employed in uremia. Hypodermics of strychnine followed by administration of strophanthus and nitroglycerin by the mouth cauased rapid clearing of the stupor in direct proportion with improvement in his peripheral circulation, and twenty-four hours after admission he sat up in bed, took his food, and was generally quite decidedly clearer. Subsequently he lapsed somewhat, and his mental condition never wholly cleared up. A month later he was transferred to the Philadelphia Hospital, where his condition became less satisfactory, being one of extreme prostration and partial dementia. He was not easily manageable in the medical wards, and was transferred to the Insane Department, where he subsequently died without further developments. The records of his two earlier attacks are very fragmentary, not even the urinary examination being preserved. The diagnosis of uremia appears to have been made because the patient was comatose. In the last attack, which never cleared entirely, the duration was sufficient to have furnished some definite evidence of renal disease and uremia, had either been present, but repeated examinations of the urine failed to show any such evidence.

Vertigo, Temporary Aphasia, Ocular Disturbance, and Tinnitus with Cerebral Arteriosclerosis. All of these symptoms will be recognized as occurring in the group of conditions caused by compression of the carotid arteries and also among the manifestations of gross cerebral thrombosis. When one or the other occurs as a more or less isolated symptom in a case of arteriosclerosis, one hesitates to regard it as due to this cause alone, and very properly inclines to think it a part of some more definite focal, cerebral, or visceral condition not yet fully developed. In many instances further symptoms may occur, and a cardiac, renal, gastric, aural, or local cerebral cause may be recognized. Sometimes, however, such symptoms recur repeatedly and no further developments take place until perhaps with increasing cerebral sclerosis more distinct results follow.

Psychic Manifestations of Cerebral Arteriosclerosis. Alienists have recently taken into account far more than formerly the importance of the circulatory conditions in the brain in the development of psychoses. Barret[2] has published a study of the subject, and quotes largely from Alzheimer and Binzwanger, both of whom have contributed notably to it. Among the distinctive types of mental disease in which arteriosclerosis is recognized as an important pathological lesion are mentioned general paralysis, arteriosclerotic dementia, and, less certainly, senile dementia. Among the special symptoms in the different groups are mental fatigue, headaches, dizzy attacks, memory weakness, psychical phenomena with progressive dementia, fainting, apoplectiform seizures, and epileptiform convulsions. Aphasia, periods of excitement, and mental confusion are characteristic of some. In Barret's group of cases the loss of retentive memory was among the earliest symptoms. Later, inclination to fabulate, loss of judgment, disorientation, narrowing of the external interests, episodes of confusion and hallucinatory delirium, etc., followed more or less quickly. These briefly cited references indicate the kind and variety of symptoms as they present themselves to the alienist. The general clinician will find among them the extremes of many of the isolated symptoms presented by senile or even presenile arteriosclerotics who happily never advance to these unfortunate grades of cerebral disease.

ARTERIOSCLEROSIS IN THE YOUNG.

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In 1890 I attended, at St. Augustine, a male mulatto, aged thirty-two years, who was suffering from obliterative endarteritis with gangrene of the toes, requiring amputation. His skeletal arteries were sclerosed and beaded. He gave a history of luetic infection in his eighteenth year. As to other infections I am not able to speak.

During the period of service on this man my attention was drawn to his son, a boy aged twelve years, who by his pinched and haggard appearance, by his complexion, figure, and carriage, suggested an aged man rather than the freshness of youth. Examination revealed diffuse sclerosis in all palpable arteries, with calcification quite as advanced as that of his parent; the beading could not have been further exaggerated at any stage of life. Evidences of heart or kidney disease were absent. The boy was mentally bright, but physically stunted, frail, thin in flesh, and without muscular development. This case of general arteriosclerosis in a boy of twelve years was apparently due to congenital syphilis.

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[2] Amer. Journal of Insanity, 1905, No. 1.

FREQUENCY. Isolated references to arteriosclerosis in the young appear in literature from early in the last century; the earliest with which I am acquainted being that of Portal,[1] in 1803, who states that "rarely the vessels of young persons become ossified; however, we find ossifications in the arteries of some children whose ossifications are not far advanced." Scarpa,[2] in 1819, writes: "Ossification of the arteries cannot be said to be proper to old age, since it is sometimes met with in patients who are not much advanced in life," and Hodgson,[3] in 1815, says his "friend Young possesses the temporal artery which he removed from an infant fifteen months old, in which the coats of the vessel are converted into a complete tube of calcareous matter."

Henoch regards pathological changes in the heart not more rare in children than in adults, but changes in the larger vessels uncommon. Virchow speaks of the importance of arterial degeneration in children, and Gerhardt considered it rare in children, largely because of lack of observation.

Seitz[4] in 148 cadavers observed at the Munich Pathological Institute found 10 cases between ten and twenty-nine years, and in over 2000 autopsies found numerous cases between the ages of seventeen and twenty-five years. Waldstein[5] in 102 examinations found 8 examples between seventeen and twenty years.

Schott[6] has found arteriosclerosis with aortic stenosis at the age of sixteen. Martin[7] has seen aortitis frequently after the first year, but never disease in the middle-size branches before the twentieth year.

Romberg[8] says that in Germany the disease augments with rapidity after the fifteenth year. In 1477 sections on all ages and conditions he found 2 instances between one and fourteen years, and 5.88 per cent. between fifteen and nineteen years with walls diffusely thickened; he calls attention to the remarkable thickening and stiffening which he has observed clincially, without nephritis or rise of blood pressure in children twelve to sixteen years of age. Marchand,[9] Bäumler,[10] and Kaigi-Sawada[11] have lately referred to diffuse hypertrophy of the walls of the whole peripheral system without nephritis, in young persons. Roger,[12] in 98 cases of aortic aneurysm, found but 1 under twenty years, and of 59 abdominal aneurysms none under twenty years. Holmes[13] tabulated 13 instances of intracranial aneurysm in children, and Parker,[14] Crisp,[15] Jacobi,[16] and Keen[17] have cited numerous extracranial aneurysms in the young, a majority of which, however, on investigation are dependent upon trauma, infective embolism, or erosion by contiguity with abscess cavity. Camac,[18] from hospital records, concludes that "arterial disease in children under six years, even those who are victims of congenital syphilis, is practically unknown; in those from six to fifteen years it is rare," and, in the examination of records of 799 autopsies in children dying in the New York Foundling Hospital, finds no case of aneurysm between one and ten years. Camac, from 340 autopsy reports of aneurysm in the literature, finds in the first five years of life 2 cases; in the second five years, 3 cases, and in the second decade, 27 cases. Holt[19] has seen cerebral hemorrhage in a child of two months.

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[1] Cours d'Anatomie Méd., 1803, iii, 133.

[2] On Aneurysm, Wishart's transl., 1819, p. 89.

[3] Diseases of Arteries, etc., 1815, p. 23.

[4] Verhandl. d. Gesell. f. Kinderh., 1896, xiii, 177.

[5] Cited by Seitz.

[6] Verhandl. des Kong. f. in. Med., 1904, p. 143.

[7] Bull. soc. anat. de Paris, 1826, ii, 17.

[8] Handb. d. prak. Med., Bd. i, p. 755; Verhandl. des Kong. f. in. Med., 1904, p. 60.

Not until the recent thorough studies of the minute pathology of arteriosclerosis by Ortner,[20] Flexner,[21] Thayer,[22] Symnitzky,[23] and Wiesel[24] has the frequency and import of arteriosclerosis in the young been realized. By their work light is thrown upon previously reported cases and the relation of the acute infections to arterial disease has been established. Thayer, in a study of 189 persons long recovered from typhoid fever, states that "between the ages of ten and fifty years, 48.3 per cent. of old typhoids showed palpable arteries, as compared with 17.5 per cent among ordinary healthy individuals." Symnitzky, in 138 autopsies on persons under twenty-five years, dying of various acute infections, found sclerotic changes in the aortic wall in 38, or 27.5 per cent. Excluding cases under two years, in which it did not appear in this series, his records show aortitis in 48 per cent. of cases examined. Wiesel, from 300 autopsies of the young dying at the height of various infections, records greater or less pathological processes in the arterial coats of nearly all cases.

ETIOLOGY. Osler states: "that heredity plays a most important role is shown in the cases in which arteriosclerosis sets in early in life in individuals in whom none of the recognized etiological factors can be found." Seitz regards heredity and individual predisposition in the non-syphilitic important factors in childhood. Klebs[25] saw thin vessels in a child of thirty-two weeks. Balassa,[26] Gull,[27] and Webber[28] speak of congenital atrophy of the coats. Cruveilhier[29] described a case of aneurysm with congenital thinness of the media. Eppinger[30] reports 2 cases with anatomical wall deficiency; Dieulafoy,[31] a case of infantile cerebral hemorrhage with similar conditions. Brill and Libman[32] report a girl of fourteen years with marked family tendency to arteriosclerosis, with no history of congenital syphilis or acute infection, who died of hemiplegia. Autopsy revealed general arteriosclerosis with interstitial nephritis. The scleroses were especially located in the aorta, coronary and superior mesenteric arteries, with calcific deposits in the vessels of liver and kidneys, and here and there points of obliterative arteritis. All causes other than heredity appear to have been eliminated.

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[9] Verhandl. d. Kong. f. in. Med., 1904, pp. 23 and 48.

[10] Münch. med. Woch., 1898, v, 133.

[11] Deut. med. Woch., 1904, xxx, 425.

[12] Bull. soc. med. des hôp. de Paris, 1863, p. 499.

[13] Lancet, 1873, i, 236; System of Surgery, second edition, iii, p. 421.

[14] Trans. Med. Chir. Soc., London, lxvii, 51.

[15] Diseases of Bloodvessels, 1847, p. 75.

[16] Arch. Pediat., 1890, vii, 161.

[17] Med. News, 1887, li, 725.

[18] AMER. JOUR. MED. SCI., 1905, cxxix, 845.

[19] Dis. Inf. and Childhood, 1906, 800.

[20] Zeit. f. Heilk., 1905, vi, 121, 174, 183.

[21] See Thayer: New York State Jour. Med., 1903, iii, 21.

[22] AMER. JOUR. MED. SCI., March, 1904.

[23] Zeit. f. Heilk., 1903, xxiv, abth. f. Path. Anat., iv, p. 177.

[24] Zeit. f. Heilk., 1906, xxvii, 161.

The role of congenital syphilis has apparently been somewhat overestimated in youthful cases by earlier writers who were not aware of the part which the acute infections play in the production of focal necroses, preparing the soil for future gross lesions of greater or less moment. It has frequently been accepted without question that luetic infection is the chief factor in the production of aneurysm; hence some interest attaches to the collection which I have gathered of 46 aneurysms, at or under twenty years, clearly to be attributed to local arteriosclerosis.

The histories of these precocious cases make mention of syphilis in 12 instances, it being negative 11 times and positive once. Among 144 individual reports of juvenile arteriosclerosis collected from earlier literature, nearly all with imperfect histories, I find reference in 55 instances to congenital syphilis; it appears as a positive cause in 10, and is negative in 45 records.

Sonnenberg[33] notes 2 fatal bleedings in congenital syphilitics, after ritual circumcision on the eighth day of life, in both of whom he found arteriosclerosis of the cut vessels. Hochsinger,[34] in dissections of livers of the congenitally syphilitic, found disease of the arterioles in 5 instances.

In Symnitzky's 38 young cases, syphilis is negative, and in Wiesel's 80 detailed cases of arteriosclerosis autopsied during the active stage of acute infections syphilis does not enter as a possible factor. In adult life, however, the causative ratio rises much higher. Chiari,[35] in the study of a large number of syphilitic infections shows that mesarteritis was present in one-half of the cases.

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[25] Cited by Jacobi, Arch. Pediat., 1890, vii, 161.

[26] Cited by Jacobi, ibid.

[27] Cited by Jacobi, ibid.

[28] Cited by Jacobi, ibid.

[29] Anat. Path., liv, i, 15.

[30] Arch. f. klin. Chir., 1887, iv.

[31] Gaz. hebdom., 1887, xvi, xviii.

[32] Jour. Exper. Med., 1899, iv, 5.

[33] Verhandl. d. Gesellsch. f. Kinderh., 1896, xviii, 177.

[34] Ibid., p. 182.

[35] Verhandl. d. deut. Path. Gesellsch., 1899, ii.

Hoffbauer,[36] investigating nodular and diffuse arteriosclerosis of the tuberculous, says he "can find no pathological difference in the arterial wall between tuberculosis and nephritis" and remarks that "it is necessary for the future to give up the causal connection between blood pressure and arterial thickening." Remlinger,[37] 1905, reviewing Romberg's juvenile cases says: "Concerning the cause of so-called diffuse arteriosclerosis in the young nothing is known."

Camac, in extensive researches of hospital reports, attributes about 32 per cent. of adult aneurysms to syphilis; about 16 per cent. to tuberculosis. From his analysis of 3954 necropsies he concludes that aneurysm is three to four times as common in the colored as in the white race. From my group of non-luetic aneurysms I cull a few unique examples. Phänomenow[38] refers to an infant stillborn at seven months, with aneurysm of the abdominal aorta and local endarteritis, the abdominal circumference measuring 15¾ inches, producing dystocia. Martin saw aneurysm of the ductus arteriosus in an infant of one month. Roger made a section on a child of ten years, with negative history, barring suffocative and cyanotic seizures, revealing aneurysms of the transverse aorta. Eppinger reports a girl of ten years, without infection, with aneurysm of the right and left coronary and the intercostal arteries at their origin. Comby[39] speaks of a girl of fourteen years, who, after two attacks of acute articular rheumatism, died of aortic aneurysm.

I wish also to call attention briefly to a very few suggestive examples of apparently non-syphilitic arteriosclerosis in the young, from earlier literature. Durant[40] reports congenital arteriosclerosis in an infant of premature birth, who on the sixth day died of peritonitis incident to umbilical infection. The lesions were of a chronic character, being pronounced calcareous degeneration of the media of the aorta and pulmonary arteries. Henning[41] reports a case of congenital changes in the aorta and heart valves, in a fœtus whose mother, during pregnancy, had an attack of acute articular rheumatism. Haussman[42] described a case of fatal aortitis in a fœtus. Goodhart[43] refers to a male infant of two months, with congenital calcification uniformly distributed around the mitral orifice. Meigs[44] examined an infant of five months dying of marasmus, whose only pathological lesion was sclerosis in the left coronary artery, near its origin. Ballantyne[45] mentions great atheromatous changes in the aorta and pulmonary arteries in a fœtus of eight months. Fischel[46] had a case of endarteritis in a child of five months. Moutard-Martin[47] reports a child, without kidney involvement or luetic infection, dying of smallpox. The autopsy revealed aortic plaques and the aortic valves covered with calcific incrustations. Andral[48] found calcific plaques in the aorta of a girl of eight years, and Brooks[49] observed coronary sclerosis in a boy of fifteen years.

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[36] Zeit. f. Heilk., 1906, xxvii, 161.

[37] Zur Statistik der Arteriosklerose, Marburg, 1905.

[38] Arch. f. Gynäk., 1881, xvii, 133.

[39] Bull. de la Soc. pediat. de Paris, 1906, ii, 11.

[40] Bull de la Soc. anat. de Paris, 1899, lxxiv, 97

[41] Jahr. f. Kinderheilk., xxx.

[42] Monatsch. f. Geburtskrank., 1869.

[43] Diseases of Children, 1894, p. 612.

[44] Trans. Col. Phys., Phila., 1889, 3 S., xi, 159.

[45] Manual Antenatal Path., Edinburgh, 1902.

[46] Biedert's Handb. d. Kinderheilk., 1902.

[47] Bull. Soc. anat. de Paris, 1875, xii, 775.

Realizing how few autopsies in children have included thorough investigation of the vascular system, it becomes apparent that my collection of 146 cases, comprising a careful review of the literature up to near the present time, must represent a very small minority of cases in which such lesions have actually occurred, and this is abundantly proved by examination of recent work.

Heart lesions associated with acute infections have received much attention in the past, but the arteries have been neglected.

In 1902 Flexner made an autopsy on a man from Dr. Osler's service, twenty-two years of age, dying on the ninth day of typhoid fever, from thrombosis in the left middle cerebral artery. I quote Flexner's pertinent record of sections through the cerebral vessels in this case: "These show evidence of a most extensive arteritis. In the less affected parts of the vessel wall the muscular coat takes on a very pale stain, while in many places the fibers, which seem swollen, are separated by vacuolic spaces. At some points these are so numerous that the tissue has an almost reticulated appearance, consisting of a loose, wavy, palely staining material in which traces of elastic tissue may still be seen, and containing numerous larger and smaller clear spaces. The muscle nuclei are in many instances swollen and deformed. The internal elastic membrane has in a great part disappeared. In many places the distinction between the individual coats of the artery is wholly lost, the entire wall being infiltrated with a mass of cells the nuclei of which are extensively fragmented." Flexner concludes: "When one considers the brief duration of the clinical symptoms, the character of the thrombi (of undoubted agglutinative origin), and the extent of the vascular changes, together with the fact that these changes are also visible in vessels in which no thrombus has occurred, it would seem clear that the arteritis was the earlier change." Thayer regards it "natural to suspect that they (arterial lesions) are a result of an acute localization of *Bacillus typhosus* or of some secondary infectious agent in the walls of the vessel." Thayer[50] conceives the rôle of the acute infections as important in the production of focal degenerations which constitute an important element in arteriosclerosis.

Among 52 autopsies observed by Thayer and Brush,[51] death being caused by typhoid fever, sclerotic changes were observed in the aortæ of 30 (fresh lesions in 21), while among 62 examinations of the coronary arteries of subjects dead of typhoid fever "19 had definite sclerotic changes and in 4 more yellow opacities of the intima were observed." This thorough investigation of the vascular effects of typhoid fever was soon followed by the valuable paper of Symnitzky. Of his 38 subjects, dead from various acute infections, 24 were under twenty years of age, and I have selected this group for brief analysis. They comprise 4 cases of pneumonia, 3 of typhoid fever, 2 of tuberculosis, 2 of scarlatina, and 1 each of scarlet fever followed by nephritis, tuberculous meningitis, acute endocarditis, chronic endocarditis, typhoid fever complicated by pneumonia, cerebral sclerosis with epilepsy, tuberculosis with epilepsy, diphtheria complicated by measles and pneumonia, acute rheumatic arthritis, pyemia, chronic nephritis and peritonitis, in all of which the lesions noted were in the aorta, in 3 instances extending to its larger branches. None gave a history of syphilis, 1 of alcohol. In 9 the history was quite negative; in 15 there had been acute or chronic illness in earlier life, to which it would seem the findings might be attributed in about equal probability with the terminal malady. In 3 of Symnitzky's cases there was disappearance of the elastic elements with proliferation of the medial connective tissue; in 11 there was proliferation of the connective tissue and the elastica; in 2 only changes in the adventitia, being small round-cell infiltration around the vasa vasorum. In the same case he occasionally found different pictures of sclerosis in various stages. It is to be mentioned that among the 24 selected cases the heart was diseased eleven times, simple hypertrophy twice, hypertrophy with dilatation once, and valvulitis eight times, representing 45.9 per cent. with cardiac involvement.

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[48] Précis d'Anat. Path., 1829, ii, 380.

[49] Amer. Jour. Med. Sci., 1906, cxxxi, 778; New York Med. Jour., October 27, 1906, p. 825.

[50] New York State Jour. of Med., 1903, iii, 21.

[51] Jour. Amer. Med. Assoc., 1904, xliii, 726.

The latest and most extensive investigation of the influence of acute infections is the work of Wiesel, published in July, 1906. This requires somewhat detailed study. The number of autopsies made was 300, being the product of three years of Kretz's service at the Franz Josef-Spital, Vienna. The 80 reported cases represent a highly refined study of the beginnings of arteriosclerosis. The subjects were young, many of them infants, and macroscopic and microscopic observations were taken upon central and peripheral vessels at the beginning or height of fatal illness from diphtheria, scarlatina, measles, pneumonia, influenza, sepsis and pyemia, osteomyelitis, suppurative otitis, typhoid fever, cerebrospinal meningitis, mushroom poisoning, and other conditions. Wiesel has furnished notes of 20 cases of diphtheria, 20 of scarlatina, and 40 of other infections, in all of which, without reference to the character of the infection, similar degenerative changes are described, modified only by the length of the infective influence.

Macroscopic changes appeared occasionally, usually between the sixth and the tenth day, as minute yellowish patches in the aorta, carotids, and coronaries, and in a few instances minute projections of calcareous deposits were visible, which Wiesel regards as a postinfectious process initiating true arteriosclerosis. In the histological examinations remarkable microscopic degenerative changes were almost constant, not only in the large trunks, but in the end arteries and even in the intestinal vessels. Usually before the fifth day Wiesel states that serous infiltration of the vessel media occurs, vacuoles appear between muscle fibers, fibers are contracted and elastic lamellæ separated by a homogeneous substance which takes the stain badly, and within which appear occasional leukocytes. At this stage the elastic fibers are displaced, but no ruptures appear. The endothelium at this stage is unchanged. From the eighth to the tenth day occurs the pathological climax, rupture of elastic fibers and necrosis of the musculature. Occasionally the intima is involved. Changes are greater and earlier in the peripheral arteries. Wiesel admits uncertainty as to the ultimate fate of these acute vessel changes, but believes regenerative changes take place. In some instances a few weeks advanced, he observed new elastic fibers from the intact adventitia growing into the partially destroyed media. He reports a typhoid fever subject who, three months after recovery, died from another disease, in which new tissue growth appeared in the media of the aorta and some of its branches. In 4 cases of death about one year after recovery from diphtheria, the only abnormality consisted in unusual appearance of elastic fibers and frequent replacement of muscle elements of the media by fibrous tissue. Advanced medial necroses may continue progressively, involving the intima and developing postinfectious atheroma, and local and general arteriosclerosis, with their sequels.

There is a striking similarity between the changes in the media and such as are produced artificially by the subcutaneous or intravenous injection into rabbits of adrenalin and various other toxins. Pearce and Baldauf[52] have lately reported lesions by single injections of adrenalin.

Equally interesting are the sections of bloodvessels in persons dying from uncinariasis. Through the courtesy of Dr. Baily K. Ashford, whose work in Porto Rico is well known, I have been able to learn of his unpublished studies on the bloodvessels in this disease and to examine sections of arteries and of the liver, kidney, spleen, and skeletal vessels presenting characteristic diffuse fibroid degenerations of the media of the very young as well as middle-aged subjects. I myself have seen popliteal aneurysm in a case of uncinariasis and Claytor[53] reports cerebral hemorrhage from the same cause.

In the previously detailed cases there appears a remarkable uniformity in pathological changes in a great variety of conditions. Evidences of restitution of integrity were apparent in the cases of longer duration. How permanent the damage may be in patients

[52] Amer. Jour. Med. Sci., 1907, cxxxii, 737.

[53] Ibid., 1902, cxxiii, 10.

who survive the initial disease is not established; diffuse fibroid degeneration in the media would affect unfavorably the nutrition of the intima and lead to the early development of general arteriosclerosis or to atheromatous plaques and possibly aneurysm. The frequency of palpable arteries after typhoid fever, previously mentioned, would thus be explained. The findings of Flexner in typhoid fever, and of Wiesel in many infections, are practically identical and seem to point to a uniform primary medial degeneration in these diseases and in certain other intoxications not of bacterial origin.

The growth in knowledge of arteritis in the young, from the early gross observations of rare and accidental instances up to recent systematic and refined study, may, it seems, prove of distinct assistance in our comprehension of early developments in adult life. Whatever the arterial sequels of the acute infections may prove to be, their effect must be intensified by the commonly recognized causes, and these factors combined would develop early and abnormal expressions of degeneration, termed presenile, the primary etiology of some of which has never appeared entirely clear and satisfactory.

LACK OF GASTRIC MUCUS (AMYXORRHŒA GASTRICA) AND ITS RELATION TO HYPERACIDITY AND GASTRIC ULCER.

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Of late a number of articles have been published which deal with the physiological and pathological secretion of gastric mucus and have given a fresh impetus to the long-neglected study of these conditions. I wish to report some of my own observations on this subject which will show that the secretion of gastric mucus is a necessary function, and that lack of mucus leads to serious disturbances. For several years I have made notes on the amount of mucus found in stomach contents. Of the interesting results thereby obtained, I shall confine myself to describing a frequent finding, that is, a complete lack of mucus in the gastric contents, a condition which is pathological and which has not been described heretofore.

The reason that this condition has not been recognized is that, as a rule, the contents of a fasting stomach, gained by expression or lavage, are used for the clinical examination of mucus. In this way, however, we can only detect an abnormal increase of mucus. Although it seems that in the stomach mucus is constantly secreted to some extent, its secretion is principally connected with the digestive period. The wash water of a fasting normal stomach does not show any mucus or only small quantities. Whenever we find, in the fasting stomach, such quantities of mucus as are easily accessible for examination, we are dealing with a pathological increase. Under these conditions it is obvious that we cannot expect to gain much information about a decrease or lack of gastric mucus by examining the fasting stomach. However, I could not fail to recognize this condition of lack of mucus when I began systematically to examine gastric contents for mucus after test meals. In doing so I easily became convinced that stomach contents under normal conditions show a moderate amount of mucus after meals and that lack of mucus must, therefore, be considered abnormal. I have examined gastric contents for mucus in several thousand cases, always proceeding in the same routine way. In each case the contents were examined, macroscopically and microscopically, immediately after their removal from the stomach, one hour after a test breakfast of tea and toast had been given. Without going into statistics, I wish to give some general results derived from these observations.

Recognition of Mucus. The presence of mucus is recognized by its most characteristic quality, its coherency. Such is the case with the moderate quantities of mucus which under normal conditions are found thoroughly mixed with the bread after a test breakfast. The bread more or less finely divided, according to the degree of mastication and the degree of digestion by the gastric juice, is held together by the mucus. In pouring the stomach contents from a glass to a filter, it flows out somewhat coherently. This coherency is more pronounced when the mucus is pathologically increased, and yet it is sufficiently distinct with normal quantities of mucus to make the latter clearly visible. When no mucus is present we miss this coherency of the bread mass; the bread particles are distinctly separated, both in cases in which the bread is divided into fine particles and in cases in which it is hardly changed, and is still present in larger pieces. The lack of mucus, however, is most obvious when we find the bread very finely divided and forming a flour-like layer. The absence of mucus in the latter cases is clearly demonstrated by the ease with which these fine bread particles move about, as also by the clear fluid which quickly forms as a separate layer on top of the bread. In cases in which a great deal of mucus is secreted, this separate layer of fluid shows a distinct, slimy character. The less mucus present, the more easily and the more quickly the fluid passes through the filter and the remaining bread mass on the filter shows distinctly, whether it is mixed with mucus or not.

The presence or absence of mucus should be corroborated by the microscopic findings, which are very characteristic. When gastric mucus is present, the different elements of the stomach contents, that is, starch globules, gluten, yeast bacteria, cells, etc., are bound together by the coherent mucus into smaller or larger clumps. The mucus is recognized by numerous myelin drops which are thoroughly mixed with the above-named elements. Even in places where these elements are more separate, numerous myelin drops are found and give the whole picture a blurred appearance. Under certain conditions the mucus appears fibrillar or in the form of spirals. When no mucus is present no myelin drops can be seen, the field is absolutely clear everywhere, and the different elements, such as starch globules, gluten, yeast, etc., not kept together by the binding mucus, appear singly and are each sharply outlined—a marked contrast to the picture first described. This characteristic picture of sharply outlined bodies in a clear field is most pronounced in cases of hyperacidity, in which the gluten of the bread has been dissolved and digested, and in which all the starch and yeast globules have thus been liberated. It does not, however, depend on the digestion of the gluten, for in cases of achylia gastrica the gluten itself appears sharply outlined in a clear field, provided no mucus is present.

I have tried to demonstrate the myelin drops more distinctly by the use of sudan, which stains them more or less red, according to the amount of fat which the myelin contains. However, the peculiar dull lustre of the unstained myelin is so characteristic that there is no advantage in staining with sudan. Much more characteristic pictures are obtained by staining the specimen with diluted Lugol's solution. The Lugol stains the starch blue, the yeast yellow, thus showing these bodies in sharp contrast to the rest of the specimen. It does not mix with mucus and, therefore, we find in specimens in which mucus is present only such starch globules stained blue that are free or on the edges of the mucus, while those that are incorporated in the mucus are left unstained. When no mucus is present, the Lugol reaches every single starch globule in the specimen. The distinct appearance of these deeply stained and sharply outlined bodies in a clear field gives a most typical picture, which in itself is characteristic of the absence of mucus. From the combined result of both macroscopic and microscopic examinations, we can thus easily determine the amount of gastric mucus present.[1] Although we have no quantitative method of measuring the amount, experience teaches us to estimate it and thus we find, under normal conditions, a moderate amount of gastric mucus in the breakfast. Under pathological conditions the mucus is either increased, decreased, or absent. The amount of mucus does not go hand in hand with the amount of gastric juice. In certain cases of achylia gastrica we see increased quantities of mucus and in others no mucus at all. On the other hand, although cases of hyperacidity as a rule show a lack of mucus, we observe cases of hyperacidity with increased mucus (gastritis acida). In fact we meet with various combinations of mucus and gastric juice. I shall not discuss these questions any further, but shall limit my remarks to the lack of mucus.

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[1] I wish to mention here, that this gastric mucus can be differentiated from mucus which originates from the upper air passages. Mucus which has been swallowed is never so thoroughly and evenly mixed with the stomach contents as the mucus secreted by the stomach and is, therefore as a rule, easily recognized as a foreign body and often identified microscopically by the finding of cells from the throat and pigmented alveolar epithelium, which it carries along. When epithelial cells are found in the gastric mucus they are of a different type (cylindrical); furthermore, they are usually found only in cases of gastritis together with leukocytes. In the gastric mucus which is secreted under normal conditions, as described above, I have rarely seen any cellular elements.

LACK OF MUCUS. In my examinations after a test breakfast, I have noted a complete lack of mucus in a great number of cases, it being more frequent than an increase. The lack of mucus may be due to different causes: there is either an insufficient secretion, a condition which could be named amyxorrhœa gastrica, or the secreted mucus is digested, or it is dissolved by the action of bacteria, as we see happen in cases of bronchoblenorrhœa. A certain amount of mucus is possibly digested by an active gastric juice. However, certain considerations speak against the probability, that this complete lack of mucus in the breakfast is entirely due to its being digested.[2] First among these is the fact, which I have just mentioned, that lack of mucus occurs with varying degrees of acidity and even in cases of achylia gastrica, in which the absence of gastric juice excludes mucus digestion, while on the other hand, an increase of mucus is found in certain cases of hyperacidity with a very active gastric juice (gastritis acida). Another argument is furnished by the following observation: In a number of cases of hyperacidity, which at first showed complete lack of mucus, I found at subsequent examinations, after treatment with silver nitrate, that distinct quantities of mucus were present while the acidity remained unchanged. Therefore, the lack of mucus before the treatment cannot be explained as being due to digestion, otherwise it would be difficult to understand why after the treatment with the same active gastric juice mucus should be present.

No matter what the cause of the lack of mucus, whether it is due to diminished secretion or whether it is dissolved and digested after secretion, I think we are justified in concluding that the lining of the stomach is not well covered with mucus when we find none in the gastric contents after a test breakfast. It is at once obvious what this means. The mucus is the protective agent of the gastric mucosa. In cases in which no gastric juice or gastric juice of low acidity is secreted, it may not be of great importance whether the mucosa is covered by a thick or a thin layer of mucus. This is altogether different in cases with an active gastric juice, especially when it is of high acidity, because it is the layer of mucus which protects the mucosa against the action of the acid secretion.

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[2] I have said nothing about dissolved mucus, because we are only dealing with mucus which is visible as such both macroscopically and microscopically. Mucus which cannot be recognized as such does not act as mucus any more and, therefore, has lost its proper significance as a protective agent, which we shall see later is one of its chief functions. Furthermore, A. Schmidt (Volkmann's Vorträge, N. S., Nr. 202, p. 1131) has justly pointed out that mucus once dissolved in the stomach is readily digested and that the common tests for it, such as the acetic acid test, are unreliable.

LACK OF MUCUS AND HYPERACIDITY. We are all familiar with the various subjective symptoms of gastric irritation (burning, gnawing sensation, more or less severe pains, etc.) and the manifold reflex symptoms which occur in patients suffering from hyperacidity. An analysis of a great many histories has convinced me that all these symptoms are most pronounced in patients whose stomach contents are found entirely free from mucus. That the lack of mucus actually plays a great role here became clear to me when I noted complete absence of mucus in some of those well-known cases which present all the gastric and reflex symptoms of so-called hyperacidity, whose stomach contents, however, showed no excess of acids, but normal or even subnormal figures of acidity. There was always some difficulty in explaining the occurrence of "hyperacidity symptoms" in cases in which there really was no hyperacidity. Most authors (Stockton,[3] Steele,[4] and others) maintain that in such cases a sensory neurosis is the underlying cause of the hyperesthesia of the gastric mucosa. Without underestimating the importance of a general neurosis in the development of painful sensations, I think we have a more satisfactory explanation in some of the cases, if we consider the lack of a sufficient cover of mucus as the principal cause which renders the gastric mucosa so sensitive to secretions of a high or even moderate degree of acidity. I can offer another observation to strengthen this opinion.

ACTION OF SILVER NITRATE ON THE SECRETION OF MUCUS. No treatment removes more quickly all the so-called hyperacidity symptoms than the application, by lavage, of solutions of silver nitrate. I can state this positively on the strength of an experience gained by the treatment of hundreds of cases. When after such treatment and after the patients had been perfectly free from all subjective symptoms the stomach contents were again examined, I have often been greatly surprised to find, instead of the expected lowering of the acidity, that the high figures of hyperacidity had remained unchanged. It has already been pointed out by Baibakoff[5] that the application of silver nitrate does not necessarily reduce the secretion of the gastric juice. Although I have observed in certain cases a decided lowering of the acidity after treatment with silver nitrate, such lowering was not the rule. I have seen more cases in which the acidity remained high; in fact, in some I found even a higher degree of acidity after the treatment than they had before the treatment. And yet these patients had been freed of their annoying symptoms by the use of silver nitrate and many of them had been promptly relieved from severe pains.

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[3] Jour. Amer. Med. Assoc., January 11, 1903.

[4] Ibid., August 18, 1906.

[5] Archiv f. Verdauungskrankheiten, vol. xii, p. 54.

Such observations certainly prove that hyperacidity cannot be the only cause for the suffering of these patients. That, however, the lack of mucus plays a role here becomes plausible, when I report that I found in such cases with persistant hyperacidity distinct quantities of mucus in the stomach contents after the treatment with silver nitrate, while the examination made before the treatment had revealed no mucus at all. It was the appearance of mucus with an improved condition which first made it clear to me that the lack of mucus before the treatment was abnormal, and might account to some extent for the suffering.

The increased secretion of mucus by the use of silver nitrate is easily understood, when one reads the description of Pawlow's[6] experiments. Pawlow demonstrated, on dogs with a gastric fistula, that mucus is secreted in very large and at times in enormous quantities when a 10 per cent. silver nitrate solution is brought into the small stomach. He explains this greatly increased secretion of mucus as an effort on the part of the mucosa to combat the deleterious action of the noxious substances on the mucous membrane. My clinical observations corroborate this; they show that when the silver nitrate is used in diluted solutions (1 to 5000 up to 1 to 1000) its power to induce an increased secretion of mucus may be turned to advantage as a therapeutic agent. We thus find an explanation for the well-known beneficial effects of the silver treatment.

Another common treatment is thus satisfactorily explained, that is, the oil treatment. Oil taken before meals spreads quickly over the gastric mucosa and provides it with an artificial protective covering, in cases in which the natural protective layer of mucus is insufficient.

LACK OF MUCUS AND GASTRIC ULCER. An insufficient covering of the mucosa may lead to more serious disturbances than mere discomfort and pain. Experiments have shown that the layer of mucus protects the gastric mucosa against mechanical (Sawriew),[7] thermic, and chemical insults (Zweig);[8] we may also assume that the layer of mucus is the best protection of the gastric mucosa against the action and invasion of bacteria, as was demonstrated by F. Müller[9] for the bronchial tubes and by Walthard[10] for the cervix.

Without sufficient covering of mucus the gastric mucosa becomes more easily injured by the many insults to which it is constantly subjected. When once injured, even though slightly, the damaged part becomes more prone to the invasion of bacteria and to the digestive action of the gastric juice. Again, the thinner the layer of protective mucus the easier will these secondary deleterious insults to the injured mucous membrane take effect. Under such conditions the digestive activity of the gastric juice must be particularly pronounced when hyperacidity is present.

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[6] The Work of the Digestive Glands, English translation, London, 1902, p. 168.

[7] Inaug. Dissert., St. Petersburg, 1901.

[8] Archiv f. Verdauungskrankheiten, vol. xii, p. 364.

[9] Sitzungsberichte der Gesellschaft zur Beförderung der ges. Naturwissenschaften zu Marburg, 1896, Nr. 6.

[10] Centralblatt f. Bakterien- und Parasitenkunde, vol. xvii, p. 311.

It is probable that such occurrences are the primary disturbances in the development of gastric ulcer. The majority of cases of gastric ulcer give a history of a more or less prolonged period of suffering from so-called hyperacidity symptoms. We have seen before that this suffering is just as much due to the lack of mucus as to the increased acidity.

We see now that the lack of mucus plays also a role in bringing about the first lesion of the mucous membrane. That in such cases the first superficial lesion may gradually grow and get deeper becomes clear when we consider the chronic nature of the gastritis which at the same time causes both the lack of mucus and the hyperacidity. The persistency of both these disturbances explains the development of the ulcer and also its eminently chronic character. We should bear this in mind when dealing with a gastric ulcer, and should try to treat all disturbances which cause the development of the ulcer and account for its chronicity. One of these disturbances is the lack of mucus. A treatment which brings about an increase of gastric mucus helps to cure the ulcer.

We thus understand the effect of the time-honored treatment of gastric ulcer by silver nitrate, which, as we have seen before, causes an increase of mucus. I frequently had good results by applying silver nitrate in cases in which the regular Leube-Ziemssen treatment had accomplished very little.

How important an increased secretion of mucus is for the healing of a gastric ulcer is demonstrated by the clinical experience that the development of a mucous gastritis proves more conclusively than anything else that the ulcer has healed. This clinical experience finds corroboration in Turck's interesting experiments. Turck,[11] who succeeded in producing artificial gastric ulcers in the dog, has lately studied the factors concerned in the healing of such ulcers. Among the changes noted during the process of repair he demonstrated a great increase of mycogen cells, in fact to such a degree that even zymogen cells were transformed into mycogen cells.[12] We thus see that this transformation, while it is really a pathological change, acts as a beneficial agent in the healing of an ulcer.

A similar interpretation may be applied to other conditions which are accompanied by an increase of mucus: An increase of mucus, though apparently pathological, may often prove to be nothing but a more active manifestation of a useful function which serves to protect the mucous membrane. A. Schmidt[13] has explained the profuse secretion of mucus from any mucous membrane as a favorable symptom, because it shows that the upper layers of the mucous membrane are not greatly degenerated. I should like to add that it should be considered a favorable symptom because it proves that the mucous membrane is doing its duty. From this point of view we must then consider the lack of mucus an unfavorable symptom, for we have seen that diminished secretion of mucus and insufficient mucous covering deprive the gastric mucosa of its protection against all harmful influences, and particularly against the digestive activity of its own secretion.

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[11] Ulcer of the Stomach; Pathogenesis and Pathology, Jour. Amer. Med. Assoc., June, 1906; British Med. Jour., April 20, 1907.

[12] F. B. Turck. Reported at the tenth annual meeting of the American Gastro-enterological Association, Atlantic City, N. J., June 3, 1907.

[13] Volkmann's Vorträge, N. S., Nr. 202, p. 1122.

The routine examinations of stomach contents have so far been principally directed toward the secretion of gastric juice and its disturbances. A more careful study of the protective secretion of mucus and its disturbances will greatly help us to understand and to treat gastric diseases.

THE ETIOLOGY AND SYMPTOMATOLOGY OF CEREBOSPINAL MENINGITIS.

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Since its first recognition as a distinct disease by Vieusseux, in Geneva, in 1805, to the present day, epidemics of cerebrospinal fever have occurred at varying intervals and of varying severity, in widely separated localities, extending, according to Hirsch, from 45° N. (Montreal) to 30° N. (Mobile) in the Western Hemisphere, and from 63° N. (Sweden and Russia) to 30° N. (Jerusalem, Persia, and Algiers) in the Eastern Hemisphere. An even wider range might be given, however, as the disease has been noted as far South as Java between 5° and 6° S. In the vast majority of instances it has been impossible to trace the origin of one epidemic to another, only a few authentic examples of transfer of the contagion being on record

The eastern section of the United States has had a rather generous proportion of the world's epidemics, while the British Isles have been comparatively free, though during the past few months the disease has been prevalent in Belfast, Glasgow, and indeed throughout the United Kingdom, to a greater or less degree. I shall have occasion to refer, later, to reports of numerous epidemics, one of the most formidable being that which occurred in Upper Silesia in 1905, 3102 persons being attacked and 1789 dying.

Etiology. Cerebrospinal fever occurs most commonly in the winter and spring, but may be seen in the summer. It seems probable that overcrowding and bad hygiene, necessitated among the poorer classes during the cold weather, may have something to do with the more frequent occurrence of epidemics during the seasons mentioned. It may occur epidemically or sporadically. In many of our cities a few cases are observed each year. There seems to be a tendency for the contagion to cling to a locality for some time after an epidemic has occurred, a few cases being observed there during the succeeding years. Neither sex, race occupation, nor social condition seems to be of importance. One attack does not confer absolute immunity, as there seem to be a few instances at least in which there has been a bona fide previous attack.

Age. Among predisposing factors age is the most important, children and young adults furnishing the large majority of victims. It is also interesting to note that in some epidemics nearly all the cases are among children, while in others young adults are chiefly affected.

Hirsch's deductions from 1267 fatal cases were: Under fifteen years, 71 per cent ; between fifteen and forty years, 26 per cent.; over forty years, 3 per cent. In the Upper Silesian epidemic, M. Wetsenhœffer[1] says that 90 per cent of the 3102 cases were under fifteen years of age. J S. Billings[2] states that in the New York epidemic, which began in 1904, of the 365 cases from which he obtained reports there were: Under one year, 16 per cent; between one and five years, 34 per cent.; and above fifty years only about 1.3 per cent. N. B. Foster,[3] in an analysis of 30 cases, gives approximately the following percentages: Under ten years, 40 per cent.; in the second decade, 37 per cent.; in the third decade, 7 per cent.; in the fourth decade, 9 per cent.; in the fifth decade, 7 per cent. Taves[4] gives the following figures from 105 cases: One year or younger, 9 per cent.; one to fifteen years, 82 per cent.; fifteen to twenty-five years, only 9 per cent. Councilman, Mallory, and Wright,[5] on the other hand, in their 111 cases, found only 1 under one year old. Lichtenstern[6] found only 23 out of 111 cases over thirty years old. Of 110 cases reported by W. B. French[7] from the epidemic in Washington, in 1898 and 1899, there were: One year and under, 12.7 per cent.; one to fifteen years, 49 per cent.; fifteen to forty years, 24.5 per cent ; over forty years, 13.6 per cent. Taking the figures given by Hirsch, Westenhoeffer, French, and Taves, whose method of division allows them to be conveniently combined, we see that of 4584 cases, over 78 per cent were fifteen years of age or younger

Bacteriology. The specific microörganism which is now considered to be the cause of cerebrospinal meningitis is Diplococcus meningitidis or intracellularis, from the fact of its being found usually within the leukocytes. It was first described by Weichselbaum in 1887, though Lichtenstern, in 1885, found in the exudate from a case of meningitis a few, cocci sometimes singly, sometimes in groups, similar in arrangement to gonococci enclosed in the leukocytes. Weichselbaum's discovery attracted but little attention until it was emphasized by Jager, who found the organism in 12 cases of epidemic cerebrospinal fever in the garrison at Stuttgart, in 1895.

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[1] Berl. klin. Woch., 1906.

[2] Med. Record, November 18, 1906.

[3] Amer. Jour. Med Sciences, 1905.

[4] The Etiology and Diagnosis of Cerebrospinal Meningitis, Providence, 1906.

[5] Amer. Jour. Med. Sci., March, 1898.

[6] Quoted by Councilman, Mallory, and Wright.

[7] Report of the Health Officer of the District of Columbia, 1899.

Diplococcus intracellularis has now been demonstrated in such a large majority of cases that there seems no doubt that it is the specific cause. Typical meningitis has been produced by injecting cultures of the meningococcus into the spinal canal of goats (Heubner, Councilman).

Among experiments upon animals some of the most interesting have been reported by Flexner,[8] who was able to produce in monkeys an acute inflammation of the meninges resembling that found in man in many respcets. To produce any appreciable effect on these animals it was necessary to inject a large quantity of a fresh culture into the spinal canal, as when thrown into a vein or into the tissues practically nothing occurred except slight local tenderness and swelling. The inflammation in monkeys extended to the membranes covering the olfactory lobes and into the ethmoid plate and nasal mucosa. The latter was often found inflamed, and smears from its surface often showed diplococci resembling in many respects Diplococcus intracellularis. In no case was he able, however, to cultivate this organism, which was probably due to its brief viability in the nose of the monkey. Flexner points out the important fact that the olfactory inflammation in these cases shows that the localization of the exudate at the base of the brain is not necessarily produced by an infection through the nasal mucosa, as has been urged by some.

As to whether the meningococcus is in all cases the specific agent in cerebrospinal meningitis of the epidemic type, there is some room for doubt, since in the reports of epidemics there is a considerable number in which other organisms, such as the pneumococcus, have been found. Thus, E. Marchal,[9] in an analysis of 418 epidemic cases, gives the meningococcus as the cause in 73.4 per cent.; the pneumococcus in 16 per cent., and other organisms in 10.5 per cent. And in 95 sporadic cases the meningococcus was the cause in 50.5 per cent , the pneumococcus in 42.1 per cent., and other organisms in 7.4 per cent. There have occurred in this city during the past few months 11 sporadic cases of cerebrospinal fever in which an organism has been found in the spinal fluid. They were divided as follows: Meningococcus, 6; influenza bacillus, 2; pneumococcus, 2; an unidentified bacillus, 1. H. Schottmüller[10] states that he found the meningococcus in 43 out of 49 epidemic cases, and that in three instances mixed infections were found—the tubercle bacillus, pneumococcus, and streptococcus. In Taves' 105 cases no organism other than the meningococcus was found. In Councilman's series mixed infections were not uncommon. Thus the pneumococcus was found seven times in connection with Diplococcus intracellularis, and Friedlander's bacillus once. These observers failed to find the meningococcus in the spinal fluid at autopsy in a case in which it had been obtained on a previous occasion by spinal puncture, showing that the organism may die out. M. Westenhoeffer[11] states that in the Upper Silesian epidemic Diplococcus intracellularis was the most common organism, but that mixed infections were very frequent. The most common mixed infection was that with Diplococcus crassus.

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[8] Jour. Exp. Med., March, 1907.

[9] Central. für Bakteriol., vol. xxxii, 1902–1903.

[10] Münch. med. Woch., Nrs. 31 to 36.

Communicability. This question is of the greatest importance, and yet we are in almost total ignorance concerning it. In fact, it has never been absolutely proved that it is contagious in the ordinarily accepted sense. Not a few observers have likened it to pneumonia in its communicability. There seems to be no tendency for the disease to cling to houses, as does tuberculosis, for instance but it does cling to localities, as has already been said. After an epidemic sporadic cases are very likely to crop up for a greater or less number of succeeding years. Numerous instances are on record in which two or more persons have been stricken in the same house I shall mention only one or two of the most striking instances as examples. Osler's[12] record of the "Wagner family" is so striking that I shall quote his words: (1) A son, a young man of about twenty years, returned home on Monday, February 7, complaining of severe pain in his head. He had fever with much vomiting, and his head and neck were arched. He was very delirious, became rapidly worse, and died on Saturday, the 12th. (2) A sister, who had helped to nurse her brother, was taken ill on Monday, the 14th, with similar symptoms, and died in four days. (3) A second sister became affected in a few days, and for two weeks was desperately ill; she then began to improve, and is now well. (4) The mother, who was worn out nursing the children, was taken ill on March 17, and died in two days. She had slept in the same bed with No. 3, who was admitted to the hospital and subsequently recovered

A. Gardner Robb,[13] of Belfast, speaks of 5 from one family, ranging in age from sixteen months to fifteen years, taken ill within four days of one another, and of 5 out of 6 in another family, who became ill within ten hours of one another, resulting in death to 4 within thirty hours; the sixth child was stricken ten days later and also died.

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[11] Berl. klin. Woch., 1906.

[12] On the Etiology and Diagnosis of Cerebrospinal Fever, Cavendish Lecture, West London Medico-Soc., June 16, 1899.

[13] Lancet, Sondon, February 23, 1907.

It is quite evident that in Robb's cases these individuals must have been exposed to infection at about the same time, except the sixth child, who did not become ill for ten days. In the Wagner family, on the other hand, infection seemed to pass from one to the other.

Drs. Park and Bolduan[14] state that of 1500 cases, in a recent epidemic in New York, 200, representing 88 families, had been in direct contact with other patients and that many of these latter showed evidence of infection from still others. Rieger,[15] in 30 instances out of 77 cases, was able to trace the infection, either directly or indirectly, to those who were infected. The period of incubation is unknown, but is supposed to be about three days.

Mode of Entrance of the Organism. As to how the causal organism reaches the brain and spinal cord, or how it again emerges to infect others, we are still in ignorance. The most plausible theory is that the germs are inspired and, finding a resting place in the nasopharynx, in some way as yet undetermined reach the brain, perhaps through the lymphatics, the tonsils being the port of entrance or perhaps through the cribriform plate of the ethmoid bone. This theory has been strengthened by observations made along this line by Goodwin and Sholly,[16] who were able to isolate the meningococcus from the nasal secretions in 50 per cent. of 52 cases of cerebrospinal fever during the first two weeks of the disease, and in 10 per cent. of 45 of those most closely in contact with them. As a control the same test was made upon 55 students who had not knowingly been exposed to infection, and of these only two showed an organism which resembled the meningococcus culturally and pathologically, but which did not have the same specific agglutinins.

Westenhoeffer, in examining a number of cases in the Upper Silesian epidemic, found that in every case of acute disease an inflammatory reaction in the fauces, especially in the tonsil, was to be found. This inflammation spread over the whole fauces, to the posterior nares, into the cavities of the nose, and also downward on the posterior pharyngeal wall. Cultures from the areas showed the meningococcus and Diplococcus crassus sometimes in pure, sometimes in mixed culture. The organisms corresponded in several instances to those found in the spinal fluid. The same author[17] says that, in making cultures from the nose, care must be taken to go far back, as the cultures from the anterior nares are always negative, even though the organism be found deep in the cavities. He suggests that this is due to the drying effect of the air upon the anterior nares. Certainly the evidence thus far collected points to infection through the nasopharynx and probably through the lymphatics.

Symptoms. All grades of the disease may be seen; the description here given is of the severe type. The onset is usually sudden, those seized in most instances having been in excellent health. The suddenness of onset is well illustrated by the following case of Foster's: A man while walking along the street was seen suddenly to stumble and fall. He then had a convulsion, which was repeated after he was taken to a hospital. After recovery, the man said he had been in perfect health, and remembered no headache until he became conscious in the hospital.

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[14] Med. Record, November 11, 1905.

[15] Klinisch. Jahrb., 1905-1906.

[16] Jour. Infect. Dis., 1906.

[17] Klinisch. Jahrb., 1905-1906.

Headache of an intense character is generally the first symptoms. The pain may be general or be especially in the occipital region; it has been described as remittent with exacerbations. Pain may extend down the back and spread around the body into the abdomen or into the joints. Vomiting is likely to occur In the fulminiating cases delirium, unconsciousness, and coma, with or without convulsions, rapidly ensue. There may be a remission upon the third day, as was observed in a case recently seen with Dr. Leech. Convulsions are much more common in children, and the younger the child the more likely are convulsions to occur. Rigidity of the postcervical muscles, with, later on, retraction of the head, is almost always observed. A common decubitus is upon the side, with the head thrown far back, the thighs flexed upon the abdomen, and the legs upon the thighs. Paralyses are often seen, such as ptosis, strabismus, etc., or of one limb, and occasionally a complete hemiplegia.

The tendon reflexes are variable, in some instances exaggerated, in others absent or greatly diminished, occasionally differing on the two sides, as was observed in my Case I. Koplik's[18] observations upon the Babinski reflex, if generally confirmed, are of great value; he found it present only exceptionally in cases of epidemic cerebrospinal meningitis, while present in 23 out of 52 cases of tuberculous meningitis. Its value is said not to be great in children under two years of age. Kernig's sign is of great diagnostic importance. In Billings' series it was absent in only 7 out of 365 cases, and was present in 87 per cent. of Taves' cases. It is, however, by no means pathognomonic of the disease under discussion, having been observed in other forms of meningitis, in pneumonia with cerebral symptoms, and in typhoid fever.

Hyperesthesia is said to be an important symptom, especially in the earlier stages, for after the onset of unconsciousness there may be almost complete anesthesia. Koplik found hyperesthesia rare in tuberculous meningitis. Irritability and restlessness are the rule. Photophobia is often observed. Incontinence of urine and feces is frequent, or there may be complete retention. Constipation is the rule. Fever is most variable. The pulse is usually regular and in proportion to the fever; the same may be said of the respirations, but they may be irregular or of the Cheyne-Stokes variety.

Koplik[19] speaks of hydrocephalus as a complication of the disease. The most important variety occurs very early, sometimes within thirty hours of the initial symptoms. The overdistention of the ventricles causes such pressure upon the brain as to produce complete paralysis, the child lying limp. In these cases the typical signs, such as rigidity of the neck, opisthotonus, and Kernig's sign, may be absent, only to return when the pressure has been relieved by spinal puncture. Koplik lays great stress upon the value of Macewen's sign in diagnosticating this complication, both when it occurs early and later in the disease, except in children too young for their skulls to have become rigid (up to about one and one-half years).

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[18] Jour. Amer. Med. Assoc., April 6, 1907.

[19] Amer Jour. Med. Sci., April, 1907.

Herpes and petechia seem to be the most common skin eruptions, both being observed in about 25 per cent. of all cases. The former is usually seen about the mouth, nose, or forehead, the latter on the trunk, on the extensor surface, and about the joints. The petechial eruption in some cases resembles so closely a brush-burn as to be mistaken for such. This mistake is not to be wondered at in cases in which restlessness is great and delirium violent. A number of other eruptions have been observed, such as urticaria, erythema, rose spots similar to those of typhoid fever, bullous, vesicular, and measly eruptions. Osler saw in three cases of his series a very remarkable rash which he describes as follows: "There was a diffuse livid erythema of great intensity, on which purpuric herpes developed —a vesicular rash the individual vesicles of which became filled with blood." It occurred in the neighborhood of the joints, particularly over the extensor surfaces of the knees, elbows, and about the ankles.

A leukocytosis is always present, and is said to persist even in the most protracted cases. There is a relative increase in the polymorphonuclear leukocytes. The fluid withdrawn by spinal puncture varies somewhat: it may be clear, turbid, purulent, or, more rarely, colored with blood. It is, however, generally turbid.

There is not, as a rule, much trouble in obtaining fluid by spinal puncture in these cases, but it has been noted that in some instances, a puncture through the lower lumbar interspaces may be negative, while one from the second might be positive. This is probably explained by the gravitation to the lower part of the canal of the thick floculent material, which will not pass through the needle. During intermissions the fluid often becomes clear. Usually an immediate examination of a smear obtained from the bottom of the tube in which the fluid has been received, if the latter be thick, or after centrifugalization, if it be clear, will result in the finding of Diplococcus intracellularis. More rarely the organism can only be found after cultures have been grown. To make a positive diagnosis it then only remains to identify the organism.

PROGNOSIS. The mortality has varied greatly in different epidemics. It may be put down as from 20 to 80 per cent. During the earlier periods of epidemics the death rate is usually higher than it is later, the virulence of the infection seeming to diminish. The fulminant cases usually result in death. Generally speaking, the earlier coma sets in, and the more profound it is, the worse is the prognosis. It is by no means impossible, however, for the coma to disappear and for the patient to recover. It is well not to be too sanguine because of the return of consciousness, however, for after hours or days coma may recur and death ultimately result. In Case II coma disappeared completely on the third day, and the patient was quite rational and comfortable; unconsciousness soon came on again, and death occurred on the fifth day of the disease. Permanent disabilities may remain after the attack, such as blindness, deafness, paralysis, chronic hydrocephalus, etc.

TREATMENT Consideration of this point need not detain us long. Inasmuch as evidence points to at least a moderate amount of contagiousness in the disease, each patient should be isolated; and taking advantage of Flexner's observations, that when suspended in salt solution the meningococci rapidly die, it seems advisable, not only to douche the nose and pharynx of the patient with this harmless solution, but to have those in attendance do the same.

The pain and restlessness can best be controlled by morphine; ice should be applied to the head and back; food must be administered through the stomach tube when there is stupor or coma; the bowels should be kept open.

So far opening the spine and washing the cord has not been very successful. Spinal puncture should be done, not only for diagnostic purposes, but for the relief of cerebral pressure, especially when symptoms of this condition are particularly pronounced. The serum treatment is yet in the experimental stage, though Flexner[20] has had some success in his work along this line upon monkeys. A vaccine was prepared by Dr. Lindsay from cultures of the meningococcus obtained by spinal puncture in my Case I, but death occurred before it could be used. I have seen no published accounts of this method of treatment, but have heard that thus far it has not been successful.

In view of the terribly fatal nature of cerebrospinal fever, and in view of the fact that it seems impossible to make a diagnosis between inflammations of the meninges due to the meningococcus and those caused by other organisms, such as the pneumococcus, except by spinal puncture, all sporadic cases should be reported.

CASE I.—D. A., female, aged nineteen, married, was first seen by me at 5 P.M on March 12, 1907.

History. Her father was said to have died of meningitis some years previously; the family history was otherwise negative. She had always been nervous, wilful, hysterical, and subject to severe headaches. These facts have been mentioned because they had some bearing on the diagnosis. For several days she had complained of headache, but it was not severe enough to prevent her going to the theatre on the 9th, or from playing poker on the evening of the 10th. On the morning of the 11th she had a severe headache, by evening it was intense, and she told her family she was a very sick woman. When she awoke on the 12th the pain was terrific, she vomited, and at once became unconscious. Vomiting was repeated only once or twice during the rest of her illness.

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[20] Since this article was written some very encouraging reports upon the curative effects of the serum have been issued.

The Condition When Seen. Temperature, 100.4° F.; pulse, 100; respirations, 24; comatose but extremely restless, throwing herself from one side of the bed to the other; the eyes turned upward, the pupils equal and reacting to light sluggishly; no herpes; an extensive petechial eruption upon the lower thoracic and abdominal region. This rash occurred in areas of varying size, some as large as the palm of the hand, and resembled so closely large brush-burns that they were at first mistaken for bruises resulting from injuries received through the violence of her delirium. Later it appeared above the knee-joints.

Reflexes. The conjunctival reflex was absent, as were also the knee-jerks; there was no clonus; no Babinski's sign; no response to pin-pricks, except upon the soles of the feet, the palms of the hands, and the face. Some stiffness of the neck, but no retraction of the head. Kernig's sign was present to a decided degree. There was involuntary passage of urine and feces. Lungs and heart normal. No retraction of the abdomen. No enlargement of the spleen.

March 13. There was no decided change except that ptosis of the left lid had developed and perhaps greater sluggishness of the left pupil. Kernig's sign was more marked. She reacted promptly to pressure upon the supra-orbital nerve and to electrical stimulation. The leukocyte count was 12,500, with a decided increase in polynuclear leukocytes. The urine contained a trace of albumin and a heavy deposit of phosphates.

March 14. The head was greatly retracted, the patient apparently being obliged to lie on one or the other side. The thighs were flexed upon the body, the legs upon the thighs, the forearms upon the arms, the fingers clinched. A spinal puncture resulted in the withdrawal of a cloudy fluid in which Diplococcus intracellularis was found in large numbers. Cultures made at this time from the fluid showed the organism in pure culture, but those from the nasal secretions were negative as to the meningococcus. No improvement followed the puncture. The leukocytes had risen to 28,800.

March 15. The condition was worse. The pupils were widely dilated, there was no reaction of the right and a very sluggish reaction of the left pupil. A second spinal puncture was made, but only 2 c.c. of fluid was obtained. Dr. D. K. Shute examined the eyegrounds but found nothing unusual. There was progressive loss of power in the right arm and leg.

March 16. Complete hemiplegia of the right side. Pupils contracted and immobile. Death occurred at 10.40 A.M., just five days from the onset of definite symptoms and four days after coma developed. The temperature had but once reached 103°, and hovered most of the time a little above 101°. The pulse ranged between 100 and 140; the respirations between 24 and 48 to the minute.

Treatment. Feeding by the stomach tube; an initial purge; morphine for restlessness; ice to head and back; spinal puncture. No autopsy was allowed.

CASE II.—M. W., aged thirty-one years, married, a tile-setter, was seen with Dr. Frank Leech, April 1, 1907.

History. The only point of interest in the past history is an illness which occurred about eight years ago. It began as a painful swollen ankle-joint with a rapid involvement of a number of other joints, a very high fever, stiffness of the postcervical muscles, retraction of the head, delirium and coma which lasted for a week or more. Under large doses of salicylates recovery gradually took place. The diagnosis was acute inflammatory rheumatism complicated by meningitis. The symptoms were certainly very suggestive of cerebrospinal fever, but as no spinal puncture was made there is no proof.

Present Illness. Went to bed on the night of March 30, apparently in good health; awoke on the morning of the 31st with a bad headache; vomited and soon became delirious.

The Condition When Seen by Me April 1. Comatose; temperature about 101°; pulse irregular, 65 to 90; respirations normal; marked photophobia, but no irregularity of the pupils, no paralyses; great restlessness; no retraction of the head, though postcervical muscles seemed stiff and there was resistance when the head was pushed forward. Knee-jerks very weak; some tendency to clonus; no Babinski; Kernig's sign marked on both sides. A blotchy rash upon the face; a petechial rash on the body, especially on the lower thoracic region—here it was confluent, closely resembling large brush-burns; small petechial spots on the forearms. Complete retention of urine; involuntary passage of feces. Took little or no food. Heart and lungs were normal, the spleen not enlarged.

April 2. Improvement remarkable; rational; said he had no headache; temperature and respirations normal; pulse, 100. Kernig's sign still present; knee-jerks now exaggerated; pupils equal and reacting to light. We had gone with the intention of making a spinal puncture, but the marked improvement made us hesitate, fearing that the diagnosis of cerebrospinal meningitis might have been a mistake.

April 3. Mental condition not so good, temperature rising.

April 4. Much worse, comatose, head slightly retracted, neck stiff, pupils unequal, knee-jerks absent, Kernig's sign present. Herpes on lips; petechial rash not so distinct on body, but more pronounced on extensor surfaces of legs, especially in neighborhood of joints. There seemed to be a tendency to symmetry in the distribution of the rash. Temperature 104°; pulse, 150; respirations, irregular. Spinal puncture resulted in the withdrawal of turbid fluid containing much pus. Smears showed Diplococcus intracellularis in small numbers. No cultures were made from the nasopharynx. Death occurred the next morning. No autopsy.

The points worthy of note in these cases are: The complete paralysis of the right arm and leg in Case I; the history of what was possibly a previous attack in Case II; the marked improvement, with return to consciousness on the third day, with almost immediate recurrence of coma, in Case II; the great size of the areas of petechial eruption resembling brush-burns in both cases.

THE COMPLICATIONS AND SEQUELS OF TYPHOID FEVER.

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Musser insists that many of the so-called relapses of typhoid fever are in reality localized infections. A. O. J. Kelly[1] goes farther in saying that he feels chagrined if he is unable to put his finger upon some definite cause for the return of the fever in a relapse; and that in many cases a gall-bladder infection will be found, in others an infection of the urinary tract, and in still others periostitis, osteitis, phlebitis, etc.

In order to illustrate the multiplicity of complications that may occur in typhoid fever, the following case reported by L. F. Friedrich[2] is cited, the striking features only being mentioned: Vomiting was persistent, and the vomitus consisted of mucus and bile, indicating gastric irritation. The abdominal symptoms were exaggerated. Petechiæ of large size, varying in color from bright red to dark brown, covered the abdomen, chest, and back. A severe diarrhœa was accompanied by many profuse hemorrhages. Jaundice was marked. An acute lobar pneumonia developed on the thirtieth day. Nephritis and cystitis arose, marked by alternating suppression and retention of urine and accompanied by uremic convulsions. There were nervous symptoms, delirium, coma, subsultus tendinum, carphology, and ataxia. The spine became tender and the overlying skin hyperesthetic. The patient became deaf. Herpes labialis developed and persisted, with a facial erysipelas supervening. At the end of the third month the bowel perforated, and a few days later the patient died.

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[1] Amer. Jour. Med. Sci., 1906, cxxxii, 446, 714.

[2] Washington Med. Annals, July, 1905.

In a review of 793 cases occurring in v. Jaksch's clinic from 1889 to 1903, Skutezky[3] gives the following important statistics on complications: Intestinal hemorrhage occurred in 4.6 per cent., of which 40 per cent. were fatal. Perforation took place in 1.5 per cent. of the cases, with a mortality of 100 per cent. He does not state that any of the patients were operated upon. Jaundice was seen in 0.7 per cent. and cholecystitis in 0.3 per cent. Acute nephritis was found in 3.2 per cent., of which less than half proved fatal, and albuminuria of febrile origin was demonstrated in 12.3 per cent. Of the respiratory complications, bronchitis was noted in 38 per cent.; lobular pneumonia 5.5 per cent., with a mortality of 50 per cent.; lobar pneumonia in 3.1 per cent., and pleuritis with exudation 0.7 per cent. The circulatory organs listed as follows: myodegeneration of the heart 0.7 per cent., with a mortality of 80 per cent.; pericarditis 1 case, which recovered; endocarditis 1.89 per cent., of which less than half died; embolism, all ending fatally, 0.3 per cent.; and thrombosis 2.39 per cent., with 10 per cent. fatal. 0.5 per cent. had roseola hemorrhagica, 1.89 per cent. miliaria, and 0.75 per cent. herpes labialis. Bed-sores developed in 2.3 per cent.

HEMORRHAGE AND PERFORATION. In their beginnings, hemorrhage and perforation are etiologically and pathologically similar. We may say their difference is one of degree rather than of variety. The ulceration or slough, as the case may be, results in the disintegration of the intestinal wall to varying depths. It may be deep enough to involve a vessel, or it may extend entirely through the wall, permitting the infecting contents to escape. The lesions are usually located on the free border of the intestine; consequently, this is the more common seat of the hemorrhage or the perforation. Fortunately the blood supply is relatively poor here. Were it not so the percentage of hemorrhages would be vastly larger than it now is. However, this same condition enhances necrosis and would seem thereby to predispose toward perforation. While this may be true theoretically, it does not hold pathologically.

Hemorrhage usually occurs at the end of the second week or during the third. Two-thirds of the patients recover. It varies greatly in onset and quantity, depending, of course, upon the relation of the ulcer to the vessel from which the bleeding comes; depending also upon the blood pressure and the rapidity with which the intestinal contents are forced along.

The frequency of perforation has been variously given as from 1 per cent. to 7 per cent. or 8 per cent. Curschman[4] says: "I believe that under the most unfavorable circumstances perforation occurs in not more than 3 per cent. of all cases." Taylor and Brooks do not hesitate to state that from 16,000 to 20,000 persons die annually from this cause in the United States. Briggs is more modest and puts it at 10,000.

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[3] Zeitschrift f. Heilkunde, 1906, pp. 27, ii, 14.

[4] Nothnagel's Spec. Path. und Therapie.

In investigating the anatomical location of perforation in 190 cases, Harte[5] found that 73 per cent. were in the first 30 cm. of the ileum above the ileocecal valve. Only 4 cases were more than a meter distant. In 7 cases the colon was perforated, five times the ascending colon, and one time each the transverse colon and the sigmoid flexure. Meckel's diverticulum was perforated three times and the appendix eight.

As was before said, the perforation usually happens opposite the mesenteric attachment, though rarely it may open into the mesentery and produce a retroperitoneal abscess, which may simulate an involved and broken-down gland. The perforation, as a rule, is single, but this is not necessarily a hard and fast rule, as cases are frequently reported with two or three and even more. In form it may be circular, oval, or cribriform. The margins are very frequently irregular, and the size varies greatly from that of a pinpoint up. The large, circular perforations are thought to be due to sloughing, and the pinpoint and cribriform to ulceration. Slit-like perforations are occasionally noted and thought to be due to traumatism, such as the pinching or sharp folding of a necrotic area by the movements of peristalsis. It is obvious that the escape of contents is relative to the size of the perforation. If the leakage be great, general peritonitis promptly ensues, and the symptoms of the peritonitis are often the first signs of the perforation noted. Very slight leakage may cause a localized peritonitis, with plastic cohesion of the nearby intestines. In this event, a walled-off abscess will in all probability result. Not infrequently the sloughing penetrates no farther than the subperitoneal coat, also terminating in a localized peritonitis.

It has recently been determined that certain interesting changes take place in the bone-marrow of typhoid fever patients. Longcope has found these changes in the marrow of the femur. They are congestion, œdema, lymphoid hyperplasia, and the presence of large phagocytic cells—all well pronounced. In addition, there are disseminated areas of necrosis and often degeneration of the single cell elements.

Lesions Elsewhere in the Digestive Tract. Complications such as pharyngitis, tonsillitis, and laryngitis may occur. Laryngitis is of particular interest. It may be simply an inflammation of the lining membrane, or, more seriously, an involvement of the deeper structures. In cases with laryngeal complications, ulceration and subsequent stricture are not infrequently the termination, or pus may form in and around the cartilages. This abscess formation is attended with danger in that it occasionally ruptures into the mediastinum. Emphysema sometimes follows. This infection of the cartilages, according to Keen's report, resulted fatally in 71 out of 75 cases.

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[5] Jour. Amer. Med. Assoc., October 28, 1905.

Well-authenticated ulcerations and consequent strictures of the œsophagus have been reported. Mitchell[6] writes of 6 cases and Courtney[7] of 2. Courtney states positively that in neither of his cases could the resulting strictures have been of traumatic origin. Both supervened prior to the convalescence from the typhoid fevers. As to why the larynx and the œsophagus should be the site of ulcers, there seems to be no anatomical explanation.

APPENDICITIS. Before leaving the alimentary tract, it is well to note the relation typhoid fever bears to appendicitis. It may act in two ways. The appendix may already be the site of a chronic inflammation, which simply needs the impetus of a typhoid infection to stir into activity the chronic process. Dieulafoy calls this "paratyphoid appendicitis," but this term is misleading, as it may be taken to mean an appendiceal inflammation due to that class of organisms known as "paratyphoid." Jopson[8] gives us a record of a case of appendicitis intercurrent with typhoid, in which operation demonstrated the presence of a concretion within the appendix. Secondly, the typhoid infection may involve the lymphatic tissues of the appendix. While pathologically this is nothing more than typhoid fever, clinically and anatomically it is appendicitis; and the resulting symptoms, particularly as regards pain and perforation of the appendix, are likely to complicate the diagnosis.

INTUSSUSCEPTION. Bryant and Bragg had a patient who ran an ordinary course of typhoid fever for six weeks, when he was suddenly seized with pain in the right iliac region. There was no leukocytosis. Operation revealed the following condition: "The abdomen was filled with clear serum. The small intestine near the cecum was deeply congested. A short distance from the ileocecal juncture was an intussusception 20 cm. long, invaginated both ways. A short distance farther a second one was found 12 cm. long, also invaginated both ways. Still farther a third was found 7 cm. long. This was invaginated from the right. Beyond this the gut was normal in color excepting the infiltrated patches and lymph nodes, due to the typhoid."

ENLARGED MESENTERIC GLANDS. The mesenteric glands are almost uniformly enlarged. Occasionally they reach such size as to produce symptoms that warrent an operative search for an apparent perforation. Rowland[9] tells us of 2 cases of this nature, in which he describes some of the glands as being as large as small "hen's eggs." The glands usually the seat of the lesions are those of the ileocecal region. This is very easily understood. The enlargement is due to the infiltration of leukocytes. Many bacilli are present. Foci of necrosis are scattered throughout and are possible precursors of universal softening and suppuration. But this latter condition, if the cases that rupture and produce peritonitis are a criterion, is rare. LeConte[10] was able to find but 4 reported cases up to 1904. Hemorrhage has been known to originate in these affected glands. Rostovtzeff[11] discovered a case of hemorrhage from a gland located near the appendix.

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[6] Johns Hopkins Hospital Rep., vol. vii.

[7] Jour. Amer. Med. Assoc., December 2, 1905.

[8] Annals of Surgery, 1905, xlii, 738.

[9] Jour. Amer. Med. Assoc., February 17, 1906.

ABSCESS OF THE SPLEEN. Enlargement of the spleen is not a complication of typhoid fever; it is merely a symptom. It may be regarded as evidence of the general infection of the structures that are rich in lymphatic elements, and is analogous to the infiltration of the intestinal follicles. But there are instances in which the increase in size of the spleen has been due to abscess formation.

Harrington[12] had 2 such cases, one of which was revealed by autopsy and the other by an operation intended for that purpose. This second patient's convalescence was interrupted by osteomyelitis of the right femur. The value of this second case report is somewhat lessened by the bacteriological findings, which were Staphylococcus aureus and streptococcus, and also by the fact that the splenic abscess did not develop until the fifty-eighth day of the illness, when it came as a relapse. From these it may be assumed that the typhoid infection was the predisposing rather than the active cause.

Federman[13] reports an interesting instance of this complication. It is interesting because of the unaccounted-for leukocytosis discovered on the tenth day of the illness and continuing increasingly until reaching a maximum of 300,000 ten days after the temperature was normal, at which time a pleurisy appeared. An operation for the relief of this demonstrated not only a cloudy pleuritic effusion, but also a large abscess of the spleen containing brown, odorous pus.

GALL-BLADDER COMPLICATIONS AND SEQUELS. With possibly the exceptions of hemorrhage and perforation, the gall-bladder complications and, more particularly, the late occurring sequels are the most important of the accidents of typhoid fever. Perhaps, it would be better to say the hepatic system, meaning to include the liver with its portal and biliary radicles in addition to the gall-bladder. Although these hepatic involvements have been recognized over a long period of years, the important additions to our knowledge are of recent date.

According to A. O. J. Kelly, investigators are unanimous on the following points: "(1) That the typhoid bacillus is regularly present in the gall-bladder, and commonly, in pure culture, in practically all cases of typhoid fever—indeed, it is the one region of the body from which a pure culture of the organism is most likely to be obtained;

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[10] Jour. Amer. Med. Assoc., October, 1904, p. 1188.

[11] Botkin's Gazett (St. Petersburg), No. 16, 1902.

[12] Lancet, 1905, ii, 1393.

[13] Deut. med. Woch., 1905, p. 586.

(2) that the typhoid bacillus may persist in the gall-bladder, as well as within gallstones, weeks, months, even years, after the patient has recovered from an attack of typhoid fever; (3) that cholangitis and cholecystitis (catarrhal, suppurative, and gangrenous) are by no means infrequent complications of typhoid fever; and (4) that a history of typhoid fever may be obtained in many cholelithitic and cholecystitic subjects." The source of infection may be directly through the common bile duct from the duodenum, by way of the portal circulation, by way of the systemic circulation, by way of the lymphatic circulation, or directly through the wall of the gall-bladder. The general impression seems to favor the portal system as the contaminating pathway. However, there is some evidence supporting the general circulation as the infection carrier. Reference is especially made to primary typhoid cholecystitis and cholangitis without demonstrable intestinal lesions. Pratt[14] was the first to call particular attention to this rather anomalous condition. Since then cases of primary gall-bladder inflammation of typhoid origin have been noted by Cushing, Stewart,[15] Deaver,[16] and others. Ehrlich[17] has described a case of typhoid fever with the lesions localized primarily in the biliary passages and secondarily in the liver, the intestines remaining intact. He calls the disease "septic typhoid cholangitis."

The lesions of the gall-bladder vary from simple catarrhal inflammation to total destruction of the wall of the organ and peritonitis. Stones may or may not be present, and when present frequently contain the typhoid organism. The fluid contents of the infected gall-bladder may be clear bile, bile with shreds of mucus, or bile with pus, or, if the cystic duct be occluded, the contents may be wholly purulent.

The typhoid organisms may persist within the gall-bladder for an astonishingly long time. Many patients so burdened are apparently nowise harmed. Others show the effects of the continuous reinfection of the intestinal tract by the frequent discharge of virulent bacilli from a chronically inflamed gall-bladder. The first class, in particular, are the innocent harborers and disseminators of the disease, and as such are significant from an epidemiological point of view (Kelly).

LIVER. The liver may be slightly enlarged and soft. The lesions are enlargements of the lymphoid elements and small areas of necrosis. The typhoid bacillus may be found in a large proportion of these. Those not so burdened may be regarded as being due to the presence of the toxin. The foci vary in their involvements from a few cells to a large part of a lobule. If extensive, they may finally terminate in cirrhosis (Osler).

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[14] AMER. JOUR. MED. SCI., November, 1901.

[15] Amer. Med., 1904, vii, 1018.

[16] AMER. JOUR. MED. SCI., September, 1906.

[17] Deut. med. Woch., vol. xxxii, No. 42.

The bile ducts are variously affected from mild catarrhal lesions to widespread suppurative cholangitis and, possibly, a resulting multiple abscess formation within the liver. These sterner degrees of infection may lead to abscess formation elsewhere within the body. Osler[18] speaks of suppurative pylephlebitis as one of the rarest sequels of typhoid fever. Swan reports an hepatic abscess resulting from an infective pylephlebitis originating by extension from an intestinal ulcer.

KIDNEY. Albuminuria is a not infrequent accompaniment of typhoid fever. Stolte[19] has found it in 60 per cent. of 371 cases. In the ordinary run of typhoid the kidneys are little, if at all, affected. In the severer cases there may be cloudy swelling of the epithelial cells, with more or less degeneration. Occasionally there are seen small areas of round-cell infiltration, in which softening and suppuration may take place. Acute parenchymatous nephritis occurred in 3 per cent. of Talley's series of 18,000 cases. Œdema as a result of this nephritis is not often produced, and, if the patient lives, the nephritis seldom becomes chronic. Hemorrhagic nephritis may be regarded as an exaggerated form of the parenchymatous nephritis. It tends strongly toward a uremic termination. Suppurative nephritis occurs occasionally, and in these cases the typhoid bacillus is ordinarily present.

URINARY BLADDER. Cystitis is a frequent and very annoying complication of the fever. Barring careless catheterization, it is always due to the presence of the typhoid bacillus in the urine. It seldom means more than a catarrhal inflammation of the bladder walls, though a so-called diphtheritic inflammation has been noted.

TESTICLE. This organ may be affected. However, it is a rare complication, and develops late in the disease or during convalescence. Suppuration occurs in 25 per cent. of all cases so affected. Atrophy is a rare sequence.

UTERUS. A rare instance of uterine typhoid infection has been noted by Lartigau.[20] It followed childbirth by two weeks, and after an illness of six weeks the patient died. No intestinal lesions were found, but the mesenteric glands were swollen and necrotic, with small abscesses. The kidneys also contained abscesses, and the left ovarian vein a partially softened thrombus. The cervix was covered with a hemorrhagic membrane. The typhoid organisms were obtained in culture from all the organs mentioned.

LUNGS. The pulmonary complications are the most frequent of typhoid fever. In a large percentage of cases, there is more or less hypostatic congestion. In many this hypostasis terminates in consolidation, and a bronchopneumonia ensues. Croupous pneumonia may occur early in the disease and is usually caused by the typhoid bacillus. Lobar pneumonia, as a complication, is usually due to the pneumococcus, but it is probable that the typhoid bacillus is able to produce a massive pneumonia, lobar in type. The typhoid organisms may invade an area the seat of a hemorrhagic infarction and there cause abscess formation and gangrene.

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[18] Edin. Med. Jour., November, 1887.

[19] Deut. Arch. f. klin. Med., vol. lxxxiii, 197.

[20] New York Med. Jour., June 16, 1900.

HEART AND CIRCULATORY SYSTEM. The heart muscle becomes more or less degenerated, and in severe cases presents a reddish-brown color, is flaccid, and easily torn. This myocarditis is not infrequent, but endocarditis and pericarditis are comparatively rare. Endarteritis with thrombosis is sometimes met with. The thrombi and emboli contain the bacilli and are a distinct menace to the health of the individual, as they may produce metastatic abscesses. The veins are affected in the same manner as are the arteries, but more frequently. Particularly is this true of the veins of the lower extremity. Resolution almost invariably takes place, though the recovery may be greatly prolonged.

MUSCULAR SYSTEM. Zenker has described two forms of muscle degeneration, the granular and the waxy. The former is similar to the advanced stages of fatty degeneration. The latter results in the contractile fibers becoming waxy, homogeneous masses. According to Bollack,[21] the recti are especially prone to this lesion. He says their fibers are likely to rupture and produce slight hemorrhage, making a starting point for an abscess.

BONES. Typhoid spine is an interesting complication. It was first emphasized by Gibney, who regards it as an acute inflammation of the periosteum and the fibrous structures of the spinal column. Osler considers it, however, in the light of hysterical or railroad spine, as a neurosis. McCrea[22] had 2 cases in which bony deposits were demonstrated by the x-rays, extending along the lateral ligaments and in 1 case into the intervertebral substance. The vertebræ involved are usually the lumbar.

Bones and cartilages elsewhere are the seats of both early and late complications of typhoid fever. These lesions are surprisingly common when investigated. They consist in osteitis, necrosis, periostitis, perichondritis, and so on, and are exceedingly difficult to cure. The sternum, the iliac crest, the ribs and their cartilages are the bones most frequently involved. The typhoid organism is easily obtained in culture from these lesions.

OTHER COMPLICATIONS. The parotid gland may harbor the bacillus, and as a result suppurate. Infection may extend into the ear, perhaps through the Eustachian tube or the blood. Middle-ear suppuration is a moderately common complication and very annoying. This may progress farther, as into the mastoid cells, with possibilites of cerebral involvements.

The nervous system throughout its entirety is subject to lesions.

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[21] Deut. med. Woch., August 29, 1901.

[22] AMER. JOUR. MED. SCI., December, 1906.

It may be a neuritis involving any nerve. The tender toe of typhoid convalescence is of this nature. Meningitis is not a frequent complication, though a large number of patients do suffer more or less cerebral irritation; a few cases of brain abscess have been reported. Hoffman has described an atrophy of the brain, with a widening of the ventricles. Degeneration of the ganglion cells has been demonstrated.

In the eye necrosis of the cornea, thrombosis of the ophthalmic and orbital veins, emboli of the arteria centralis retinæ, or optic neuritis with atrophy of the disk may occur.

CONCLUSION. It is possible to have a complication or sequel of typhoid fever at any time during or after the course of the illness, and in any structure of the body where the bacillus may venture or its toxin permeate.

THE LARYNGEAL COMPLICATIONS OF TYPHOID FEVER.

WITH THE REPORT OF TWO CASES.

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LARYNGEAL inflammation as a complication of typhoid fever was first observed and reported by Bayle.[1] A medical student convalescent from abdominal typhus, developed hoarseness, followed by œdema glottidis; an attempted tracheotomy was unsuccessful, the patient succumbing. Bayle's second case, also, was in a male adult who died of suffocation while convalescent on the twenty-ninth day of the disease, without any effort at operative interference. Isolated cases were reported from then on in the French literature, and in 1818 Joseph Frank of Leipzig, reported 2 cases based on the postmortem findings of Pommers and Horn. In 1825 Bouilard reported a case observed by him in 1822. A student of divinity, discharged from the hospital as cured, was admitted for hoarseness, cough, and dyspnœa. He died three days later without operative interference. The despair of these hapless sufferers has been faithfully portrayed by the early writers. Most of these tragic deaths occurred during convalescence or after the patient had been discharged as cured.

Louis, in his classical publication on gastro-intestinal diseases and abdominal typhus, in 1829 reported 4 original cases with necropsy findings. In the same year, Pockel, a military surgeon in the Braunschweiger Militar-Lazareth, performed the second authentic tracheotomy in typhoid laryngitis. The patient, a young man, convalescent of the fever, developed acute perichondritis with œdema glottidis.

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[1] Société de médecine de Paris, August, 1808.

The operation gave immediate relief with ultimate recovery. This was the first successful tracheotomy in typhoid affections of the larynx. This patient breathing through his cannula, but otherwise hale and well, was still under observation in 1869.

The use of laryngeal bougies and efforts at dilating post-typhoid larngeal stenosis were first attempted by Deschange, of Paris, in 1848. The results appear not to have been favorable, since in no case was laryngeal function regained, although an improvement in phonation was observed. Porter[2] reported 2 cases tracheotomized, with recovery; the first recorded in England.

W. W. Keen,[3] of Philadelphia, in 1876, summarized the entire literature pertaining to this condition, collecting 169 cases. These he classified clinically and pathologically, giving to the profession a lucid and instructive description, the most complete in its consideration of the subject that had appeared up to that time.

In 1884, A Luning,[4] of Zurich, in an exhaustive thesis[5] again collated the literature, collecting 192 cases to which he added 2 of his own and 12 others with clinical data. From Luning's description it is evident he had no knowledge of Keen's earlier monograph, most of his collected material being presumably identical with that of Keen, who so assumes in his volume on *The Surgical Complications and Sequelæ of Typhoid*, published in 1896, wherein he completes his earlier work by adding Luning's 14 original cases and such others as had been reported since, his total being 221 cases.

In 1903, Homer Dupuy,[6] of New Orleans, reported 1 case with 34 collected ones; and, in 1905, Chevalier Jackson[7] published the collective findings of a routine laryngoscopic examination of 360 typhoid-fever patients in the Western Pennsylvania Hospital.

By a careful search of the accessible literature, I have collected 23 cases—reported since the publication of Dupuy's paper—by Francillon,[8] Halbron,[9] Picot,[10] Johnstone,[11] Quinlan,[12] Boston,[13] Del Aqua,[14] Day and Jackson,[15] Chevalier Jackson,[16] Roque et Banset,[17] Herbert,[18] Pater,[19] Wilson,[20] Pierat and Stordeur,[21] Weil and Lemaire.[22] These, with my own two cases, bring the total to

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[2] Dublin Med. Journal, 1836.

[3] Keen's Toner Lecture.

[4] Deut. Archiv f. kliniche Chirurgie., 1884, Band. xxx.

[5] Uber. die Laryngo-und Tracheo-Stenose und ihre chirurgische Behandlung.

[6] New Orleans Medical and Surgical Journal, 1903.

[7] Amer. Jour. Med. Sci., 1905.

[8] Bull. et mém. hôp. de Paris, 1903, p. 257.

[9] Bull. et mém. de Soc. anat. de Paris, 1903, p. 699.

[10] Gaz. hebd. de sci. med., Bordeaux, 1904, p. 98.

[11] New York Med. News, 1905, p. 1021.

[12] Laryngoscope, St. Louis, 1905, p. 17.

[13] New York Med. Jour., 1907, p. 301.

[14] Clin. et prat. Treviglio, 1905, p. 146.

[15] Annals of Otology, Rhinology, and Laryngology, 1904, p. 24.

[16] Amer. Jour. Med. Sci., 1905, p. 861.

[17] Lyon médicale, 1903, p. 269.

[18] Chicago Medical Recorder, 1904, p. 509.

[19] Bull. et mém. Soc. anat. de Paris, 1904, p. 38.

[20] Jour. of Michigan med. Soc., Detroit, 1904, p. 400.

[21] Jour. med. de Bruxelle, 1907, p. 82.

[22] Archiv. intern. de laryngol., Paris, 1906, p. 899.

281, which, omitting Jackson's studies, include practically all the cases heretofore reported.

Etiology. As causative factors are to be considered:

1. The friction and irritation of the physiological acts of phonation and swallowing, and the pathological act of coughing, trifling insults in themselves, but constant in their repetition—operating on a surface which is part of an organism suffering from a general typhoid toxemia.

2. A mucous membrane itself in a state of catarrhal inflammation with swollen surface epithelium.

3. Thermic influences, such as heat or cold, or both in rapid succession, including sudden drafts.

4. Bacteria. That lymphoid tissue, regardless of its distribution in the human economy, may be subject to primary invasion by the Eberth bacillus is now accepted by most observers. The bacilli have been isolated in sections, and grown in pure culture from the larynx by Schulz[23] in 1894, W. Williams in 1901,[24] and R. W. Weil[25] in 1905. Herbert and Liebman[26] and also Chevalier Jackson[27] cultivated it in pure growth from the pus of perichondrical abscesses. The Klebs-Loeffler bacillus has been isolated in pure culture and as a mixed infection, the earlier pathologists recognizing a membranous or diphtheritic and a simple ulceration in typhoid fever. The streptococcus and other pathological bacteria usually present as a secondary infection may act as the primary factor. Roberts[28] reported a case of Ludwig's angina complicating typhoid fever, in which he succeeded in demonstrating streptococci in pure form. Murray[29] in 1903 reported a similar case.

5. In my own Case I, the submucous infiltration of the aryteno-epiglottic folds was due to a direct extension of the pharyngeal involvement in a double parotitis.

6. Ditrichs attributed to dorsal decubitus a role in the etiology, holding that by gravity a venous statis with softening of the tissues of the posterior laryngeal wall might be produced, inviting abrasion and injury; and in the light of our present knowledge of the physical processes on immunity,[30] it is not unlikely that the decubitus weakens the native resistance of the mucous membrane to the entry of pathogenic organism.

Pathology. Ulcerative lesions of the larynx in typhoid fever, while recognized by the early pathologists, were considered an accidental foreign infection, Rokitansky of Vienna, in 1842, being the first to give this lesion careful study. With wonderful intelligence he anticipated our present conception of it, referring to it as a true metastasis of the typhoid poison, in every sense analogous to the developments in the intestinal mucosa. Keen, in 1876, classified the lesions according to the degree or depth of tissue involvement, as inflammatory or submucous laryngitis, ulcerative laryngitis, and laryngeal perichondritis, of which neither stage can be sharply outlined, they at times overlapping one another. The frequency of its occurrence is stated by Luning to be 12 per cent., basing his statistics on 1032 autopsies. Of the 2000 Munich cases 10.7 per cent. showed laryngeal ulcer, and J. C. Baer[31] found laryngeal ulcer in 3.4 per cent. of 89 autopsies held at the Presbyterian and the Cook County Hospitals of Chicago.

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[23] Berl. klin. Wochenblatter, Band. xxxv.

[24] Diseases of the Upper Respir. Tract, 1901.

[25] Trans. New York Path. Soc., 1905.

[26] Chicago Med. Recorder, 1905.

[27] Ibid.

[28] American Medicine, 1901.

[29] American Medicine, 1903.

[30] Jonathan Wright. New York Med. Journal, 1907.

The type of lesion most prevalent varies with the material of the observer. Luning divides the 12 per cent. of laryngeal lesions into 1.5 per cent. of simple or submucous laryngitis and a little over 5 per cent. each of ulcerative laryngitis and laryngeal perichondritis.

Distribution. The findings at autopsy do not accord with clinical observation. In over 4000 autopsies collected by Luning, and his agree with the observations of Keen, the posterior laryngeal wall at the insertion of the vocal chords involving the cricoid cartilage, was the seat of the lesion in 60 per cent. The arytenoid cartilages and interspace the next, the aryteno-epiglottidean folds, epiglottis, and thyroid cartilage being least affected in the order named. Chevalier Jackson, in his series of 360 routine laryngoscopic examinations in typhoid fever subjects found ulcer present in 68 cases; the frequency of distribution being: epiglottis 42 times, aryteno-epiglottidean folds 22, interarytenoid space 18, and arytenoid cartilage 10.

Laryngeal inflammation may occur at any time between the first and the tenth weeks. Over 70 per cent. of the cases reported occurred after the third week. Of mine one was in the third and one in the sixth week. Ulceration of the larynx, shown by the collective statistics of all observers to be present in typhoid fever in from 10 to 18 per cent. of all the cases, is clinically diagnosticated in only a very small precentage of this number, perhaps one in twenty or less.

Clinically, the onset is, as a rule, insidious and unobserved. If it be during or before the fastigium, the patient, with sensibility benumbed, is too apathetic and indifferent to pain to make complaint, or delirium may becloud the symptoms. Extreme dyspnœa and suffocative spasm may be the first intimation that even a close observer may obtain of the grave process transpiring. In this asthenic state, the first attack may terminate fatally, or with great and agonizing effort the patient will cough up blood, stained sputum and serum, with temporary relief and easier breathing, only to be followed by recurrent seizures. In the greater number, however, this complication occurs when convalescence is well established; doctor and patient both secure in the belief that all danger is past and no further difficulty need be anticipated. And equally to be dreaded here, is the stealthy onset masked by the treacherous mildness of the symptoms. These are in the order of their frequency: hoarseness, voice change, aphonia, inspiratory stridor, dyspnœa, cough of metallic or laryngeal character, and dysphagia. Any of these may be overlooked or misconstrued by the attendant as a manifestation of a simple post-typhoid asthenia, until, with tragic unexpectedness, an acute œdema of the glottis involves the sufferer in a desperate struggle with death. Or, again, without any of the violent respiratory exertion usually preceding suffocation, an asthenic apnœa, may, without the slightest warning of its approach, terminate life. Indeed, so sudden, terrible, and menacing to life are these conditions that they demand immediate and the boldest action. Surely foolhardiness has no place in the practice of medicine, but in a developing œdema glottidis, or threatened apnœa, timidity may be even more destructive to life, and prompt operative relief is the rational and conservative indication.

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[31] Amer. Jour. Med. Sci., 1905.

My Case II and one reported by J. W. Boyce[32] are cited in illustration:

J. H., admitted to Dr. Zemansky's service in convalescence from typhoid fever, on the tenth day in the Hospital and the thirty-seventh day since the onset of the fever, developed some hoarseness and a higher pitch of voice, with metallic cough, and inspiratory stridor. There was no dyspnœa or dysphagia. Laryngoscopy showed slight congestion of the laryngeal mucosa, with no ulceration or restricted movements of the cords. The symptoms were not at any time considered urgent, and with cocaine locally (2 per cent. spray) and ice externally, appeared speedily to clear up, so that no further trouble was apprehended; when without any further warning, forty-eight hours after the first signs, the patient developed an acute œdema of the glottis, with suffocative spasm, causing cyanosis and unconsciousness. An immediate laryngotomy performed with an ordinary pocket penknife, by Dr. London, of the house staff, saved the patient's life. So acute was the emergency that there was no time to send for instruments.

Boyce, of Pittsburg, reports a patient with laryngeal complication, who was taken to the operating-room to be tracheotomized as a precautionary measure, not because it was needed, but for fear it might come to be during the night in the doctor's absence. During the leisurely preparations for a systematic operation, he accidentally noticed that the patient had stopped breathing. The surgeon standing by with knife in hand was able to stab the patient on the instant, and it required ten minutes of artificial respiration before the patient could be trusted to do his own breathing. Dr. Boyce states there would have been no time to send to another room for instruments.

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[32] Annals Otology, Laryngology, and Rhinology.

May such conditions not account for some of the unexplained, sudden deaths occurring during typhoid fever? It were far better, if by clinical signs and laryngoscopy, an early diagnosis were made and such emergency work anticipated by early and timely operation, with due surgical precaution.

In typhoid fever the slightest hoarseness or change of voice or cough should at once awaken suspicion, and in every case laryngoscopic investigation should be instituted; no complaint of pain, however slight referred to the throat in breathing or in swallowing, should fall on deaf ears; for in the words of W. W. Keen, such complaints may be "the vagaries of a delirious mind, but they may also prove to be the heralds of the greatest danger."

Prognosis. Appended below are tables giving the general result of 243 collected cases of which clinical data were obtainable. The columns represent: (1) The entire mortality percentage, (2) the mortality percentage of operated cases, and (3) the mortality percentage of non-operated cases.

Collected by	Died.	Recovered.	Operated on.		Unoperated on.	
			Died.	Recovered.	Died.	Recovered.
W. W. Keen . . 197	132	65	55	44	77	21
Homer Dupuy . 26	13	13	7	6	9	4
Rieser 20	13	7	13	4	1	2
Total 243	158 or 65 %	85	75 or 58 %	54	87 or 76 %	27

These statistics would show laryngeal inflammation in typhoid fever to be a complication with a death rate next to that of intestinal perforation. They are not conclusive, however, since it cannot be stated how many of these fatalities are directly chargeable to the laryngeal condition and how many to the underlying general infection.

The comparison of the tables of mortality of the operative with the non-operative cases forms a convincing argument for operation; and it may be said that careful laryngoscopic observation with early operation will very greatly reduce an appalling, and, in part, a preventable mortality.

Of Jackson's 68 cases, 8 were tracheotomized, and not one death in the 8 was directly referable to the laryngeal complication.

Treatment. The first impulse after having made a diagnosis of laryngeal inflammation in typhoid fever should be to place the patient in a zone of safety—by that I mean under constant and competent observation—in readiness for immediate operative relief should demand therefor arise. Having thus secured the patient, steaming the larynx, or ice by the mouth, or an external pack may be tried. Spraying locally with a 2 per cent. solution of cocaine or a 1 to 1000 solution of adrenalin chloride at times gives relief, blanching and contracting the tissues if the inflammation be slight and transitory; such medication may tide the patient over. If, however, symptoms be persistent or become aggravated, or if stenosis be established restricting the laryngeal function, operation should be resorted to, laryngotracheotomy being the rational measure. Intubation with the O'Dwyer tube has been performed with success, but is not an advisable operative proceeding; of 5 cases[33] [34] reported within the last two years in which intubation was performed, the results were unsatisfactory and later tracheotomy had to be resorted to in each case. By use of the tube in abscess formation or sloughing perichondritis, free drainage is interfered with. The danger of plugging is great and constant, and in the vitiated condition of the laryngeal tissues, the pressure of the tube itself may add to the existing ulceration.

The treatment of post-typhoid stenosis of the larynx and trachea belong to the domain of laryngology and it is not the purpose of this paper to discuss it.

Conclusion. Pathological involvement of the larynx is very much more frequent than is clinically diagnosticated. Clinically, laryngeal involvement may constitute one of the gravest complications of typhoid fever; the stealthy and sudden onset of œdema makes it particularly to be dreaded. Early tracheotomy is the rational and life-saving operation and should be performed as soon as stenosis is positively established. The frequency of this complication pathologically, and the possibility of its extreme clinical gravity, warrant that it receive more careful consideration than it has heretofore received in the text-books, in discussions of typhoid fever, and at the bedside of the patient.

Case I.—*Typhoid fever; intestinal hemorrhage; double parotitis with unilateral suppuration and œdema of the glottis.*

L. R., aged seventeen years, white. Born in United States. Occupation, optician's apprentice. Admitted to the service of Dr. A. P. Zemansky April 11, 1907.

The patient, a fully developed adult male, of large frame, had been in care of his family physician and came to the hospital in the second week of his illness, which had been diagnosticated as typhoid fever. From the time of his admission to April 21, the disease seemed to run a mildly even course. The temperature fluctuated between 102° and 103.4°; pulse from 80 to 90. Rose spots were present, and the spleen was enlarged. Leukocyte count 8600, with 32 per cent. lymphocytes. Widal reaction positive.

On April 22 and 23 the patient had recurrent, large intestinal hemorrhages, with wide fluctuations in the temperature curve and presented the clinical picture of a severe and increasing toxemia.

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[33] J. H. Quinlan. The Laryngoscope, St. Louis, 1905.

[34] W. L. Boston. New York Med. Journal, 1907.

April 24. Patient in a state of muttering, restless stupor. Tongue dry. Slight swelling observed beneath the left ear involving the parotid gland.

April 25. General condition unchanged, left parotid gland and entire cheek swollen, red, shining, and very tender. Right parotid gland slightly swollen. Blood examination: hemoglobin 70 per cent.; white blood count 8600.

April 27. Face very much swollen; deglutition difficult and painful. The pharyngeal tissues are deeply injected and swollen, almost occluding the pharyngeal cavity. Attempted laryngoscopic examination difficult and unsatisfactory. Temperature, 105°; pulse, 120; respiration, 30. Patient in stupor and very restless.

About 3 P.M. respiration became labored and difficult; lividity and cyanosis gradually developed, clearly indicating that the supraglottic laryngeal tissues had become involved and œdematous.

A high tracheotomy was performed with immediate respiratory relief. The patient remained in a stuperous condition thoroughly overcome with the severe typhoid toxemia, and died without regaining consciousness on April 28, at 12.25 P.M.

Cultures for Klebs-Loeffler bacillus from smears by the mouth and through the cannula were negative.

At postmortem, wound examination, to which we were restricted, showed the cartilaginous box of the larynx and the trachea absolutely normal. Firm pressure over the left parotid gland caused a free flow of pus through the left auditory canal.

CASE II.—*Typhoid fever with submucous laryngitis and acute œdema of the glottis.*

L. R., aged twenty-four years, white. Born in Germany. Single. Occupation, shipping clerk. Admitted to Dr. A. P. Zemansky's service April 12, 1907.

Patient, a well-built adult male, was admitted convalescent, in the fourth week of typhoid fever. The clinical course had been mild and without complication—his chief complaint now being marked asthenia.

From the time of admission to April 20, the patient's temperature was normal, and a gradual, steady improvement in his general condition was observed. Widal reaction positive.

On April 20 he developed hoarseness with slight cough, and an inspiratory stridor which seemed at times to become harsher, and then again entirely to disappear. There was no dyspnœa or dysphagia, and no complaint of other discomfort. Laryngoscopy showed some injection of the vocal cords without ulceration, or apparent restriction in movements.

Ice externally and by the mouth with a local spray of 2 per cent. solution of cocaine hydrochloride was ordered, the patient being kept under close observation.

Repeated laryngoscopy on April 21 showed no further lesion. The symptoms had apparently cleared up under treatment, there remaining only a persistent aphonia.

April 22. At 9 A.M., after a good night's rest, the patient very suddenly developed respiratory obstruction, became deeply cyanosed and was threatened with immediate suffocation. So sudden and complete was the development of this stenosis as to demand instant operative relief.

Laryngotomy by incision through the cricothyroid membrane was performed, and tube inserted by Dr. London of the house staff, who used an ordinary pocket penknife, the condition being too urgent to risk the delay involved in sending to the operating-room for instruments. Relief was prompt, cyanosis at once disappearing; respiration through the cannula became regular and unobstructed.

Swabs taken by the mouth and the cannula for cultures of Klebs-Loeffler bacillus proved negative.

June 1, 1907 The patient is still under observation and wearing the cannula. Laryngoscopy shows marked injection of the cords at their posterior commissure with restriction of movement. There is no visible ulceration. An attempt to remove the cannula was made about ten days after operation and once since then, but laryngeal breathing becoming difficult after three or four minutes, made it necessary each time to replace the cannula. Excepting a slight febrile reaction the temperature rising to 101.8° on the second day after operation, the patient's general health has not suffered any from his laryngeal complication.

PURULENT CEREBROSPINAL MENINGITIS CAUSED BY THE TYPHOID BACILLUS, WITHOUT THE USUAL INTESTINAL LESIONS OF TYPHOID FEVER.

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William W., colored, aged thirty-four years, a native of Virginia, a coal picker by occupation, was admitted to the Philadelphia General Hospital, to the service of Dr. F. P. Henry, on account of headache, dizziness, constipation, and fever. His father and mother are dead; cause unknown. His wife and one child are living and well.

He had the ordinary diseases of childhood; otherwise he has always been healthy. The present illness began six days before admission with headache, dizziness, and vomiting. He went to bed the next day, and was delirious on the third day. Severe pain in back of head, and some pains in the legs were his complaint. He had some fever, but no epistaxis. He passed fairly large quantities of urine.

On physical examination he was a large, muscular, well-nourished negro, who lay in bed with his head slightly retracted, very restless, groaning, and picking at the bedclothes. He was profoundly unconscious. The eyes showed marked congestion of bulbar and tarsal conjunctivæ, and slight ptosis of both lids. The eyes were drawn upward and to the left. The pupils were small, equal, but did not react to light. There was some mucopurulent discharge from the conjunctivæ. The tongue was coated, dry, and fissured. Sordes were on the lips and teeth; the breath was foul, but had no characteristic odor. The pulse was rapid, regular, and the tension high. The pulmonary resonance was good throughout. The breath sounds were loud and clear. A few moist rales were heard at the right base. The heart was normal. The abdomen was rigid, but no special areas of tenderness could be palpated. Liver dulness seemed to be normal. Spleen could not be palpated. The arms were flexed and held stiff; the legs were tossed about. The knee-jerks were about normal, the right slightly more prompt than the left. Plantar irritation caused the foot to be drawn up, and the toes to be flexed on both sides. The spine was rigid and slightly concave. The neck was rigid. Kernig's sign was present.

April 14. Lumbar puncture was performed and about 25 c.c. of a turbid fluid withdrawn, which, on standing, deposited a heavy purulent sediment.

April 5. Kernig's sign was still present; the arms were somewhat rigid. The knee-jerks were absent; plantar irritation elicited no response. Still profoundly unconscious. Lumbar puncture was again performed and 30 c.c. of turbid fluid withdrawn, and 3000 units of diphtheria antitoxin and 30 minims of lysol were injected into the canal. Hot packs seemed to have beneficial effects on convulsions, which were not so frequent or severe.

April 6. The condition grew worse. Examination of fluid from the spinal canal showed no diplococci of Weichselbaum, but a bacillus which looked like typhoid. Leukocytes, 14,000; Widal suggestive. Pulse rapid, weak, and almost imperceptible. Urine analysis: amber; flocculent; acid; 1030; hyaline casts, few large amorphous urates. Died at 5.15 P.M.

The cerebrospinal fluid was cloudy, alkaline in reaction, and contained small coagula. Cytoscopic examination showed 96 per cent. polynuclear cells, 2 per cent. lymphocytes, and 2 per cent. hyaline cells. Shreds of fibrin were also present. Bacteriological examination showed numerous bacilli, intracellular and extracellular, principally in the polynuclear cells, though a few were also seen in the hyaline forms and lymphocytes. These organisms possessed the morphological and tinctorial properties of a typhoid-like organism.

Inoculations made into various culture media gave rise to a growth of an organism which resembled the typhoid bacillus; that is, grayish-white growth on agar, cloudiness in bouillon, slight acidulation without coagulation in milk, no gas production in lactose or saccharose media, no liquefaction of gelatin, and no indol production in cultures. This organism resembled in all particulars the bacteria observed in spreads, and was agglutinated in dilutions of 1 to 40 with a known typhoid serum and with the serum of the patient.

5 c.c. of blood was obtained (under aseptic precautions) from the vein of the arm and inoculated into 200 c.c. of bouillon. A growth was observed in twenty-four hours, and consisted of an extremely motile bacillus, Gram negative, and resembling in subcultures upon various media, the organism obtained from the cerebrospinal fluid. Agglutination was positive in dilutions of 1 to 40 with the patient's serum, and also with a known typhoid serum. Inoculations of 2 c.c. of a forty-eight-hour bouillon culture into the subcutaneous tissue of a guinea-pig failed to produce any pyogenic process.

At autopsy spreads and inoculations were made from the pus upon the brain. The spreads contained an organism identical with that observed in the cerebrospinal fluid during the life of the patient. A Gram negative motile bacillus was obtained which corresponded in all particulars with the organism isolated from the blood during life. Sections of the cord and cerebellum were stained with Loeffler's methylene blue and eosin, polychrome blue and eosin, and by the Gram-Weigert technique. Numerous intracellular and extracellullar organisms were found, resembling the bacilli encountered in spreads and cultures; they were especially abundant in the cord.

This organism, from its morphological, tinctorial, and biological character, resembles in all particulars Bacillus typhosus.

Certain of the autopsy notes (made by Dr. A. J. Smith) are of particular interest: The spleen weighs 110 grams, and is not adherent; capsule is smooth and thin; the organ is of a dark-slate color, rather flaccid, and cuts with normal resistance. Cut surface, dark red; Malphigian bodies enlarged; vessels and trabeculæ not prominent. The intestines throughout are normal on the exterior; show venous congestion, and walls are quite thin. Mucous membrane of small intestine normal; toward ileocecal valve the membrane is injected, becoming red, and close to valve marked by points of hemorrhage. No follicular enlargement. Peyer's patches are large in their flat extent, but not raised; are pale and show no signs of typhoid, medullary swelling, or ulceration. Large intestine normal externally and in thickness of wall; likewise shows venous congestion. Mucous surface is moderately congested in upper part; shows no ulceration. Appendix 8 cm. long, of normal caliber, extends toward median line, and is adherent to posterior peritoneal surface. The lumen opened, the mucous surface shows follicles as tiny, black spots; no ulceration. Mesenteric glands are slightly enlarged, fleshy in consistency, reddened in color. Kidneys show nothing indicative of typhoid infection. Dura mater is tense and congested; upon removal the pial vessels are deeply injected and their course marked out by surrounding yellowish lines of pus; no excess of meningeal fluid. At the base of the brain, about the pons and medulla, extending into the spinal cord, a large amount of pus wells out as in an abscess. Exposure of middle ear fails to show the presence of pus. Dura over base showed no evidence of extension of disease from nasal portion. Cord shows infection of vessels outside of dura; throughout its extent, and especially in upper two-thirds, it was covered with a purulent exudate, similar to that present upon the base and convexity of the brain.

Pathological Diagnosis. Purulent cerebrospinal meningitis; cloudy swelling of the liver and the kidneys; acute catarrhal enteritis, with enlargement of Peyer's patches.

The case reported is unusual because of presenting a purulent lesion caused by typhoid bacilli, and because of the absence of the customary intestinal lesions of typhoid fever. The patient died on the ninth day of his illness and the autopsy showed that beyond a very little enlargement of the mesenteric glands and a slight change in Peyer's patches, which change might easily be accounted for by the enteritis which was present, the patient showed no typical typhoid lesions.

A bacillus in pure culture, which seems fairly identified as the bacillus of Eberth, was isolated from the blood and the spinal fluid, from spreads and inoculations from the pus upon the brain, and was found in sections made from the cord and cerebellum.

Cole[1] reviews the literature of typhoid meningitis. He speaks of 14 cases reported by various authors in which there had been present purulent, fibrinopurulent, or hemorrhagic purulent meningitis, with general typhoid lesions. In 1 case, however, no autopsy was obtained. He also mentions 13 cases of similar purulent meningitis in which the identification of the typhoid bacillus was not so certain, and of several cases in which there was mixed infection of other germs and the typhoid bacillus.

Neumann and Schaeffer report a case similar to ours in that there was present purulent cerebrospinal meningitis without the usual typhoid lesions, and though the organism isolated by them from the pus appeared in many respects similar to the bacillus of Eberth, they did not feel altogether satisfied to place it definitely in that class.

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[1] Johns Hopkins Hospital Reports, 1905.

MacCallum reviews at length the pathology of the condition and finds "nothing peculiar in the histological study of typhoid meningitis unless it be the relative abundance of large phagocytic cells, found particularly about the veins, but also scattered through the tissues."

In our case there were a large number of polynuclear and mononuclear cells, but the large phagocytic cells did not predominate. In this instance the meningitis appears to have been a primary lesion due to the typhoid bacillus, and the intestines had escaped the ordinary lesions which would be expected to be present at the ninth day of typhoid fever. The history was very carefully reviewed in regard to the possibility of the patient having had typhoid fever at a recent date, and the first statement that the man had been ill but six days before admission was firmly adhered to.

CHRONIC FIBROUS MYOCARDITIS IN PROGRESSIVE MUSCULAR DYSTROPHY.

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The following case of progressive muscular dystrophy is reported because of the interesting associated lesion of the heart muscle, and not because it adds anything to our knowledge of the lesion of the striated muscle. The case came to postmortem examination at Bay View Hospital, Baltimore, during my service as pathologist to that institution. The patient was admitted the day previous to his death, in a moribund condition, so that satisfactory clinical examination was impossible, nor could a satisfactory history be obtained. It was learned subsequently that the patient was the only child of German parents; that his mother had died about a year previously of consumption; that the boy's trouble had begun when he was about five years of age, at which time, as quaintly expressed by the informant, "all of his legs seemed to be slipping down below his knees," and he became weak, losing gradually the power to walk and finally to help himself with his hands. Since about his ninth or tenth year he had been confined to a chair. He had always been able to talk clearly and to whistle.

The body presented the typical picture of muscular dystrophy, and almost identical with the picture shown by two cases of the family type previously reported by me. The autopsy protocol follows:

Frederick S. Male, white, aged fifteen years. Died October 2, 1905, 3.30 P.M. Postmortem, October 2, 5 P.M.

The body is that of an emaciated boy 130 cm. in length. There is extreme pallor of the skin and mucous membranes. The face is infantile in appearance. The genitalia are undeveloped and pubic hairs are absent. There is extreme atrophy of the upper arm on both sides, of the pectoral muscles, and of those about the scapula. The forearms and hands show no appreciable atrophy, and the muscles appear well developed. The legs are flexed on the body and at the knee, with the feet held in an equinovarus position. The thighs are much atrophied, especially the extensor group. On attempting to straighten the leg, there is found to be marked tension of the hamstring group. The calves are large and firmly contracted, and appear hypertrophied in contrast to the thighs.

On incision and dissection of the skin from the thorax, the pectoral muscles are found reduced to a thin sheet of fibrous tissue. Section of the rectus femoris shows it to be pale and fibrous in character, but it evidently still contains muscular tissue.

The abdominal cavity is found free from excess of fluid, with smooth, glistening peritoneal surfaces. There are old fibrous adhesions binding the mesocolon to adjacent coils of the small intestine, and the descending colon is displaced, lying in the mid-abdominal line.

The heart appears small and weighs 100 grams. The valves are normal. The surface of the heart and the cut surface of the muscle are extremely pale and of a grayish pink color. Section of the wall of the left ventricle shows numerous translucent areas, evidently fibrous in character, between groups of muscle fibers. These areas are not confined to any portion of the section, but lie for the most part just beneath the epicardium, and the subepicardial adipose tissue appears to invade the muscle. The heart wall is very firm.

The left lung is of grayish pink color over the greater part of its surface, becoming of a deep red in the posterior portion. The upper lobe is moist and congested on section, and appears air-containing throughout. The lower lobe shows the bronchi much dilated to their terminations and full of purulent material. About the smaller bronchi are areas which are opaque yellow in color and which appear consolidated. The right lung on section appears much more moist in its upper lobe, which is almost gelatinous, but appears air-containing except for a small area somewhat wedge-shaped, of a grayish color, and quite solid. In the lower part of the upper lobe and in the lower lobe the bronchi are diffusely dilated, are filled with pus, and surrounded by small areas of consolidation, as in the left lung.

The bronchial lymph glands are much swollen, almost gelatinous on section, and of a gray color. They are free from areas of caseation.

The spleen is larger than normal. Capsule and trabeculæ are delicate. The pulp is increased in amount, but is firm and cuts sharply. The Malpighian corpuscles are prominent. The liver is of normal size and weighs 980 grams. It shows no surface abnormality. The cut surface is uniformly cloudy; the lobules are indistinctly outlined, but apparently are enlarged. The gall bladder is shrunken and contains but a few centimeters of bile. The stomach is small and contracted. The mucosa is pale except for injection of the tips of the rugæ. The mucosa is covered with mucus. The pancreas appears normal. The mesenteric lymph glands are somewhat swollen; they are free from caseation. The left kidney is slightly above normal size. The capsule strips easily from a smooth injected surface. On section the cortex is wide with regular striation, injected vessels, and swollen cloudy parenchyma. The right kidney resembles the left. Weight 250 grams. The aorta appears small, and when opened measures but 3 cm. across at the origin of the left subclavian artery. The wall is thin, but very elastic. The bladder is contracted; its mucosa normal. The testicles are small and puerile. The intestine is normal except for quite marked injection. Both lateral lobes of the thyroid are large, but appear normal on section. The spinal cord shows no gross abnormality. Examination of brain not permitted.

Anatomical Diagnosis.—Progressive muscular dystrophy; chronic fibrous myocarditis; hypoplasia of the aorta; chronic suppurative bronchitis; diffuse bronchiectasis; bronchopneumonia; cloudy swelling of the viscera; hyperplastic bronchial lymphadenitis.

MICROSCOPIC EXAMINATION. *Pectoralis Major.* The muscle is entirely replaced by a mass of loose connective tissue, showing between fibrous areas of varying density numerous lobules of adipose tissue. Muscle fibers are nowhere to be seen in the section. Extending through the tissue are many large bloodvessels and nerves. The arteries and veins are free from intimal thickening, and the nerves show no abnormality, the axis cylinders and myelin sheaths being well preserved.

Rectus Femoris. Cross-section. The muscle fasciculi are separated by loose connective tissue containing many fat cells. In the fasciculi the muscle fibers are reduced in number and are separated from each other by a fairly dense, cell-poor connective tissue, which shows an invasion by adipose tissue in many places. The muscle fibers vary much in size, the majority being smaller than normal; although in every fasciculus there are numerous hypertrophied fibers. The fibers, as a rule, show wellmarked Cohnheim's fields, and appear normal, although here and there one finds a dense homogeneous, deeply eosin-staining hyaline fiber. The sarcolemma nuclei are increased in number, and in numerous hypertrophied fibers lie within the muscle cell. The neuromuscular bundles lie in the interfascicular connective tissue, and appear normal except for a slight increase in the size of the muscle fibers. The arteries and nerves of the muscle show no lesions.

In longitudinal sections the striation of the non-hyaline fibers is well marked. The increase in sarcolemma nuclei is more apparent, the nuclei occurring in clusters and rows along both the atrophied and hypertrophied fibers.

Biceps Muscle. The section shows a picture similar to the above, except that the great majority of the fibers remaining are hypertrophied and show both hyaline and vacuolar degeneration.

Spinal Cord. Sections cut through cervical and lumbar enlargements and the dorsal cord show no lesions. There are no areas of sclerosis in the white matter, and the ganglion cells of the anterior horn are normal in number and appearance.

Cords of Lumbar Plexus. Section shows no appreciable abnormality.

The Heart. The pericardial surface is normal, and shows beneath it considerable adipose tissue. Its vessels are entirely free from sclerosis. Throughout the thickness of the heart wall there are areas in which muscle fibers are lacking and in which their place is taken by cell-poor fibrous tissue. This tissue is somewhat more lax toward the epicardium, being in many places firm and scar-like near the endocardium. There is no regularity of distribution of these patches, but they seem especially numerous toward the epicardium. There is considerable variation in the size of the muscle fibers, those toward the epicardium being, for the most part, small and atrophied in appearance and, as a rule, showing vacuolation of their centres. In the deeper layers many of the fibers are hypertrophied, and show often coarse, swollen, deeply staining nuclei. Vacuolation is frequent. There is also some segmentation and fragmentation. Pigment is not increased.

Aorta. The aorta shows a slight diffuse thickening of the intima, with here and there a somewhat elevated, more cellular nodule, in which the cells show fatty degeneration. The longitudinal muscle fibers of the intima are well developed, but are in many places vacuolated and have pale, swollen nuclei. In the deeper layers of the media muscle fibers appear unusually scarce and separated from the elastic lamellæ by an increased amount of fibrillar connective tissue.

Lung. The pleural surface is free from exudate, but the membrane shows a dilatation of the bloodvessels and an increase in fibrous connective tissue with round-cell infiltration. The septa of the lung also show an increase in connective tissue and are œdematous. The vessels of the lung are generally dilated. The bronchi throughout the section are dilated, and are filled with pus cells and desquamated epithelial cells. The walls of the bronchi are thickened and are infiltrated with round cells, while the lymphoid foci throughout the section are hyperplastic. The alveolar walls, especially near the bronchi, are infiltrated with round cells, and in places show a fibrous increase. The alveolar content varies; generally it consists of desquamated epithelial cells and a granular precipitate, but in patches one finds an inflammatory exudate of fibrin, leukocytes, and desquamated cells, or simply of pus cells.

The Bronchial Lymph Glands. The section shows the lymph sinuses dilated, containing serum and a variety of cells, chiefly large mononuclear phagocytes. The follicles are rich in lymphocytes, and the germinal centres are very prominent. Mitotic figures are present.

Liver. The section shows no lesion beyond an extensive fatty degeneration of the parenchymatous cells.

Spleen. The spleen shows a hyperplasia of the Malpighian corpuscles and an infiltration of the pulp spaces and sinuses, with red blood cells and leukocytes. The pulp cells are increased in number.

Kidney. The section shows the organ to be normal except for the swollen granular condition of the parenchymatous cells, and the granular content of the tubules.

Testicle.—The spermatic tubules are lined by a single layer of undifferentiated cells. The interstitial tissue is œdematous. Interstitial cells numerous.

Stomach. The mucosa is covered by a thick layer of mucus and desquamated cells. The mucosa appears hypertrophic. In the well of the stomach many muscle fasciculi show a disappearance of muscle fibers and an invasion by connective tissue. Some of the fibers appear hypertrophied, while many are vacuolated.

The foregoing, then, is a typical case of muscular dystrophy of ten years' duration in a boy in his sixteenth year, with atrophy of the shoulder girdle and upper arm muscles, of the thigh muscles, and with apparent hypertrophy of the calves, and from the history probably no facial involvement. The lesion was farthest advanced in the pectoral group of muscles, which had been reduced to a thin sheet of connective tissue infiltrated with fat. Yet one may not conclude that the lesion began in that group, as the extent of the lesion may simply indicate a more rapid rate of progression in that group than in the other muscles affected.

The lesion of particular interest was that in the heart muscle. The similarity of the picture offered by the muscle of the left ventricle to that of the striated muscle was striking. There was degeneration, atrophy, and hypertrophy of fibers, and also a numerical atrophy, the fibers being replaced by scar tissue. The cell-poor and fibrous condition of this connective tissue and the absence of lymphoid infiltration seemed to give strong evidence that the process was not a recent one, but instead quite remote in point of time, and a process it seemed impossible to connect etiologically with the acute inflammatory bronchiectasis. In fact, there was in the postmortem findings no indication of a cause for the lesion. There was no sclerosis of the coronary vessels, and the distribution of the lesion varied from that usually seen in cases of vascular disease. The patches of myocardial atrophy, instead of being more or less sharply limited to the inner layers of muscle adjacent to the endocardium, were scattered throughout the thickness of the heart wall and were most numerous close to the pericardium and the blood supply. The aorta was slightly reduced in diameter, and its intima somewhat thickened. Yet it does not appear probable that that slight variation from normal would throw sufficient excess of work on the heart to lead to such injury, without greater resulting dilatation and hypertrophy. In the absence of a careful and exact history of the case it is impossible to exclude absolutely the occurrence of some infectious disease that might have produced the primary injury to the heart muscle, yet if one may judge from the slight signs of injury such as one usually finds following fatal attacks of acute infections, that factor may safely be excluded.

Thus from a careful consideration of the case it is difficult to escape the conclusion that the heart lesion was part of the disease, and that in the cause of the lesion in the striated voluntary muscle one will find the cause of that in the heart.

In the attempt to ascertain whether the smooth muscle fibers were affected in any way I was limited in my search by the fact that the stomach was the only hollow viscus from which tissue had been preserved. Yet in the muscular wall of the stomach there were definite lesions, quite similar in character to those in the striated muscle, although much less extensive. In numerous fasciculi there was numerical atrophy of fibers and the fasciculi were invaded by connective tissue, as was clearly shown by a Mallory stain. Some of the remaining fibers were vacuolated and degenerated in appearance and others appeared hypertrophied.

In the wall of the aorta, also, the longitudinal fibers of the intima especially showed vacuolation and signs of degeneration, and the fibers of the media appeared less numerous than is normal for the age of the patient. There appeared also to be an increase in connective tissue in the media as well as a thickening of the intima.

One may not from a single case draw the conclusion that muscular dystrophy is a disease affecting all types of muscular tissue in the body, and only after searching the literature can he realize how inadequate are the reports of muscular dystrophy in postmortem examinations for the determination of the point in question. Neuropathologists generally seem to have been contented with the examination of portions of the voluntary muscles and of the nervous system from their cases, and to have made but casual notes, if any, of the state of the viscera; and although in a number of cases the gross appearance of the heart is noted, in but few is there mention of a microscopic examination. However, from the rather limited reported autopsies some give positive evidence of myocardial lesion.

Sachs and Brooks[1] report the autopsy findings in a case of Erb's juvenile type in a man of twenty-four, in whom "the myocardium shows a great diffuse fibroid infiltration which is most extensive in the wall of the left ventricle, where it is distinctly patchy in distribution. The intima of the aorta and the endocardium are slightly thickened, but hardly enough to be considered a pathological state. The coronary arteries are normal in appearance. The heart weighs 13 ounces." "The microscopic examination showed a much less degree of interstitial increase than the gross appearance led one to suppose. The wall of the left ventricle exhibited a moderate augmentation of the interstitium, the hyperplastic tissue being entirely of an adult type and being most abundant about the vessels. The papillary muscles showed proportionately a much greater interstitial increase. The cardiac muscle cells were found everywhere to be in a very natural condition, and, notwithstanding the apparent degeneration noted in the gross examination, there was no atrophy of the cells, no abnormal pigmentation, and no evidence of abnormal nuclear activities." As a result of finding the muscle cells normal, and in spite of the interstitial increase in tissue, the authors exclude the heart from involvement in the disease.

Goetz[2] reports the heart of a muscular dystrophy patient of ten and one-half years, as giving evidence at autopsy of being clearly somewhat involved in the firm consistency of its wall. He further reports, as a result of the clinical examination of 10 patients with muscular dystrophy, the ages of 9 of whom ranged from seven to nineteen years, the tenth being fifty-five years, that in 6 of the 10 the heart dulness was definitely increased.

Rinecker[3] notes, at the postmortem examination of a boy of eight and one-half years with muscular dystrophy and gastrocnemius hypertrophy, that the heart was hypertrophied.

Middleton,[4] in a boy aged sixteen, found the heart very small, the left ventricle contracted, and its myocardium pale. On microscopic examination there was no hyaline degeneration of the muscle fibers, and the only lesion was an increase of the interstitial connective tissue, not very pronounced. In a second subject, aged thirteen and one-half years, the heart weighed 3 ounces and appeared healthy.

Laignel and Lavastine[5] emphasize the clinical observation of extreme cardiac instability and palpitation in a male patient of twenty-seven with the facio-scapulo-humeral type.

Erb,[6] in a patient of thirteen, with hypertrophied calves and atrophy, elsewhere, notes merely that the heart was pale and flabby.

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[1] Amer. Jour. Med. Sci., 1901, cxxii, 54.

[2] Würzburg, München, 1879.

[3] Verh. der Phys.-med. Gesellsch. in Würzburg, 1860, x, 15.

[4] Glasgow Med. Jour., 1884, xxii, 81.

[5] Arch. gén. de méd., 1901, N. S. v, 185.

[6] Deutsch. Zeitschrift. f. Nervenheilkunde, 1891, xiii, 173.

Cardarelli,[7] in a patient of fifteen years, with the Duchenne type, found the heart normal in size, of pale color, and with marked subepicardial fatty deposits. Charcot[8] found the heart uninvolved. Eulenberg and Cohnheim,[9] in a boy of thirteen, found the heart normal in size, well contracted, and with the muscle of a pale rose-violet color.

While those cases in which the heart has been thoroughly examined and shown to be the seat of chronic myocardial lesions are few in number, they seem sufficient to confirm me in the conclusion that, in the case here cited, the heart lesion was the result of the same cause as the lesion in the voluntary muscles, and thus a part of the disease. This conclusion seems more probable when one considers the rarity of advanced chronic myocarditis in very young patients, as a result of other diseases. As to the smooth muscle involvement, the data are insufficient to draw any general conclusion, and the determination of the frequency of the lesion and its relation to the dystrophic condition must be left for further observations.

CERTAIN UNUSUAL FORMS OF HEPATITIS.

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In atrophic cirrhosis of the liver anatomists have long recognized an essentially chronic lesion which is apt to display occasional signs of activity in the occurrence of fresh connective tissue formation and infiltration of round cells. For the greater part the role of the liver cells is passive, although certain regenerative efforts may be interpreted as departures in the opposite direction. Not all is known of the different stages through which the liver passes before emerging into this chronic state. It seems important, therefore, to call attention to certain more active inflammatory lesions of this organ, partly because of their clinical significance and partly because they tend to throw some light on the genesis of the more familiar forms of chronic indurative hepatitis.

From time to time cases of chronic cirrhosis of the liver are observed in which more or less acute changes have occurred as a terminal event. Eichorst,[1] for example, records the case of a man, forty-seven years of age, who was admitted in a delirious condition and of whom no history could be obtained. His general appearance was that of a drunkard. Two weeks after admission he died, and at the postmortem examination the liver was found to be tremendously enlarged, weighing 9600 grams and measuring 35 cm. transversely. Neither icterus nor ascites was present. Microscopically it was found that the connective tissue was increased throughout. In places it was multilobular in distribution, in other places monolobular. In those areas in which it surrounded several lobules the connective tissue was poor in cells and enclosed moderate numbers of bile ducts. Where it surrounded single lobules, however, the picture was quite different. Here the connective tissue was extraordinarily rich in round cells, and proliferation of bile ducts was very pronounced. Eichorst concluded that to an originally multilobular chronic cirrhosis there had been added, recently, active connective tissue proliferation around single lobules and marked regeneration of bile ducts.

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[7] Il Policlinico, 1896, iii, 453.

[8] Archives de Physiol., 1871-2, iv, 228.

[9] Verh. der Berliner med. Gesellsch., 1865-6, i, 191.

[1] Virchow's Archiv, 1897, cxlviii, 339.

Klein,[2] in an article on the anatomy of scarlatina, states that he studied the condition of the liver in 8 cases, and that in all of them the organ was enlarged. The liver cells were swollen, opaque, and granular. The connective tissue was greatly thickened and "contained greater or smaller collections of round cells, forming sometimes continuous cord-like or nodular cell accumulations around bile ducts and bloodvessels." Occasionally such accumulations of round cells were observed "in the connective tissue within the acini." Klein's communication is accompanied by an illustration showing an interlobular space made up of wide-meshed connective tissue infiltrated by moderate numbers of round cells. The liver cells proper are not represented. Although this observer's description of the changes exhibited by the liver in scarlatina are too vague to permit of comparison with those soon to be considered, it seems not unlikely that he was dealing with a similar lesion.

Obrzut,[3] under the title of *Chronische gelbe Atrophie oder acute Lebercirrhose?* gives a complete anatomical and histological description of a case which more closely resembles those to be dealt with presently than any other that I have been able to find in the current literature or in special works on diseases of the liver. Obrzut's patient, was a man, thirty years of age, who was admitted in an unconscious condition. It was learned of him, however, that in his twelfth year he had suffered a febrile attack, from which he recovered completely. He remained healthy until the twenty-third year, when he developed an affection which appeared to originate in the stomach and which was attended by pain in that region and vomiting. Seven years later the patient was seized by acute pain in the region of the stomach, attended by frequent attacks of hematemesis and rapidly progressing jaundice. This illness extended over a period of sixteen weeks and resulted in death. At the postmortem examination it was found that the liver was greatly decreased in size, weighing 810 grams. It was firm in consistency and irregularly granular. On section the substance of the organ was irregularly divided into islands of yellowish tissue by reddish or pinkish bands. On microscopic examination it was found that the yellow areas corresponded to the remnants of the liver lobules, and that these were surrounded by bands of immature connective tissue densely infiltrated by round cells. Moreover, the connective tissue elements frequently invaded the islands of liver cells, cutting off individual cells or small groups of cells. Here and there in the lobular remnants were collections of round cells which communicated directly with those infiltrating the connective tissue at the periphery. In some instances there were round-cell foci which were completely surrounded by the liver cells, thus appearing to exist independently of those at the periphery. The cells in the central portions of the islands of liver tissue were atrophic, but their shape and arrangement were well preserved, while those at the periphery were irregularly disposed, their contour was altered, and their cytoplasm fatty. A further and very noticeable feature consisted in abundant proliferation of bile ducts.

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[2] Trans. Path. Soc., London, xxviii, 439.

[3] Wien. med. Jahrbücher, 1886, New Series, i, 463.

During the past two years I have had a number of opportunities to study inflammatory lesions of the liver presenting changes in many ways similar to those described by Obrzut, but, nevertheless, differing in certain essentials. There seems to be little doubt, however, that they belong in the same general category. In preparing to add my cases to the literature I have omitted many details from the clinical histories and from the autopsy protocols which did not seem to bear any relationship to the changes in the liver. For the same reason a large amount of microscopic detail has been excluded.

Anatomically, two types of lesion may be described: (1) A simple subacute diffuse hepatitis, and (2) a combined acute and subacute diffuse hepatitis.

1. I have observed the simple subacute diffuse hepatitis on several occasions, most often as an accidental autopsy finding. In other instances, however, the subjects presented, in addition to the changes in the liver, ascites and evidences of more or less well advanced compensatory collateral venous circulation, especially well marked in the peritoneum in front of the kidneys. For obvious reasons some of these cases were overlooked clinically, others were naturally regarded as examples of ordinary atrophic cirrhosis of the liver. One patient, who also suffered from advanced tabes dorsalis, gave a history of recurring ascites of two years' duration. A girl of twenty presented the lesions of active secondary syphilis. A history of alcoholism was not infrequently admitted. In some of the cases slight jaundice was present.

The liver in this condition is considerably enlarged, firm and heavy, and dull yellow in color. The capsule is irregularly thickened and lustreless, and numerous small reddish streaks or points are scattered through it. At various intervals the surface of the organ is made up of patches of perfectly smooth or faintly undulating tissue, while the intervening portions are occupied by groups of nodular elevations, which are conical or rounded in shape and poorly defined at the base, where they gradually merge into the surrounding tissue. Some of them, however, arise quite abruptly and are sharply defined. The individual prominences may be closely aggregated or widely separated by strips of smooth tissue. On section the organ cuts firmly. Scattered at irregular intervals over the cut surface are islands of cream colored, occasionally bile stained, tissue. These islands are slightly elevated, so that the surface feels granular. Most of them are rounded or conical, others are angular. The depressions between them are occupied by bands of glistening, grayish tissue, dispersed through which are numbers of reddish points or streaks. For the most part the islands and trabeculæ are well differentiated, but in many places the definition between them is obscure.

Microscopically it is found that there is a marked overgrowth of embryonic connective tissue which serves to divide the parenchyma into islands of different sizes and frequently of irregular contour. The connective tissue bands are broad and made up of numerous delicate, pale, poorly staining, loosely woven fibrillæ, distributed among which are vast numbers of round cells and fibroblasts. Here and there the round cells are so abundant and so closely packed as to resemble abscesses, and in these situations the connective tissue fibrils are scarcely visible. Within the islands of liver tissue the columnar formation of the cells is lost. The liver cells are pale, markedly swollen, indistinctly outlined, opaque, and finely granular; in other words, in a condition indistinguishable from cloudy swelling. In some instances bile imbibition occurs.

Occasionally there is an attempt at reproduction of bile ducts, but this occurs in isolated places only and is not prominent. Here and there the immature connective tissue supports collections of thin-walled, evidently newly formed bloodvessels, many of which are distended (Fig. 1).

2. The examples of combined acute and subacute diffuse hepatitis are described below in greater detail, because the clinical features are important and suggestive.

Case I.—Female, married white, aged thirty years, was admitted to the City Hospital, February 20, 1907, and died March 7, 1907.

The patient entered the Hospital complaining of pain and tingling sensations in the legs and of inability to walk. She was a housewife, and admitted having been accustomed to the use of one or two pints of beer a day for a long while, but stated that since New Year's she had been addicted to the excessive use of whisky, often of a cheap grade, taking it not infrequently before breakfast.

On February 17 she noticed that she was beginning to have some difficulty in walking, and that her feet ached and were the seat of tingling sensations. Three days later she was entirely unable to walk, both feet were helplessly extended, the lower limbs were tender to pressure exerted along the line of the great nerve trunks, and the knee-jerks were not obtainable. At this time the patient could use the hands freely. Two days later she complained of tingling sensations in the hands and forearms, and three days after this both hands were in the position of wrist-drop and were quite powerless. At the time of admission it was noticed that the patient's conjunctivæ were faintly jaundiced, and during the fifteen days that she was under observation jaundice gradually extended until, toward the end, it had involved the skin of the entire body. The liver was palpable 8 cm. below the right costal margin in the mid-mamillary line. It appeared to the palpating hand to be perfectly

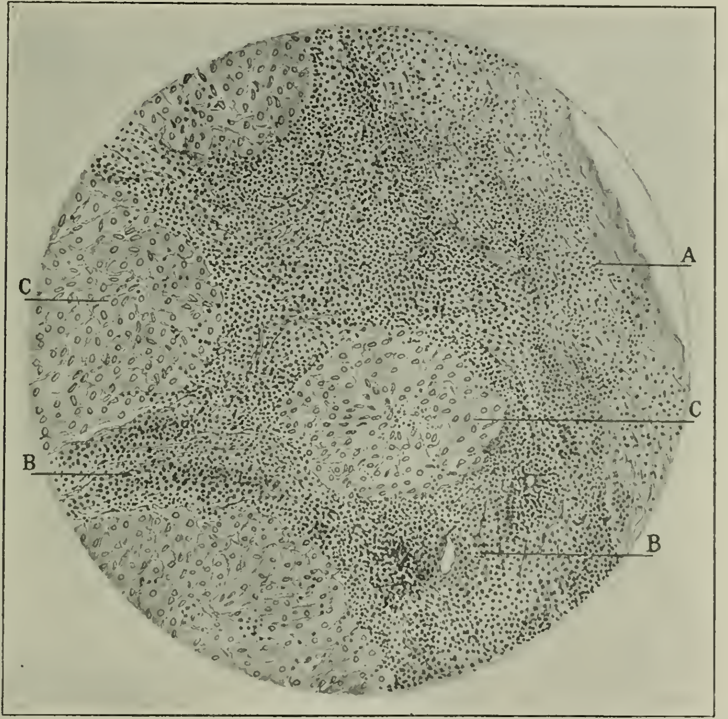

Fig. 1.—Simple subacute diffuse hepatitis. *A*, thickened capsule richly infiltrated with round cells; *B*, trabeculæ of finely fibrillar connective tissue densely infiltrated with round cells; *C*, cloudy swollen liver cells.

smooth and quite firm. There was some tenderness over the organ, but no friction rub was detected. The spleen was palpated in the posterior part of the left hypochondrium. During the first eight days that she was under observation the patient's temperature registered between 100° and 100.4° F. in the evening. On the evening of the ninth day it registered 101.4° F., and every evening thereafter until the time of death, that is, six days, the evening temperature reached 102° F. or a fraction above this point. Death occurred on the fifteenth day. The patient was conscious until the end. At no time was there delirium.

Examination of the urine showed normal specific gravity, albumin, but no casts or blood. Four days before death the leukocytes numbered 20,000, the differential count of which revealed 79 per cent. of polymorphonuclear cells and 21 per cent. of lymphocytes.

Autopsy: Nine hours postmortem. The body was well nourished and 161 cm. in length. The conjunctivæ and skin of the entire body were faintly jaundiced. There was slight pretibial œdema. On section the abdominal cavity was dry and the peritoneum appeared to be unchanged. The liver was very prominent, occupying the whole of the upper third of the abdominal cavity. The notch for the gall bladder appeared to be very deep because of the presence of a massive accessory tongue-shaped lobe projecting from the lower part of the right lobe into the right iliac fossa.

The spleen was enlarged, measuring 13 cm. in length, 9 cm. in breadth, and about 5 cm. in thickness. It was bluish in color, the surface was smooth and the capsule tense. On section the substance was swollen, friable, and finely mottled, deep red streaks intermingling with pale areas. On microscopic examination the follicles appeared to be larger than normal and richer in cells. Among the cells of the follicles were numerous eosinophiles. The pulp was abundant and richly infiltrated with polymorphonuclear leukocytes and eosinophiles. In addition there were immense numbers of cells with large, pale, vesicular nuclei, representing proliferating endothelial and connective tissue cells. In many instances the vessel walls were thick and hyaline, so that the lumen was partially or totally obliterated. The blood sinuses were prominent and filled by masses of fused, hyaline red cells.

The pancreas was large and firm and the lobules were well defined. The interlobular connective tissue was pinkish in color. On microscopic examination it was found that certain parts of the organ were intact. Sections taken from other sites, however, revealed the presence of thick bands of immature connective tissue, in which were scattered collections of round cells and numbers of thin-walled bloodvessels, apparently recently formed. The islands of pancreatic tissue enclosed in this fibrillar and highly cellular connective tissue were irregularly disposed, sharply defined, and usually rounded in shape.

The liver was large, firm in consistency, and weighed 3000 grams. The surface was cloudy, pale, and perfectly smooth. On section the organ cut firmly. Scattered over the cut surface were delicate bands of grayish or pinkish tissue between which were irregularly outlined, frequently angular islands of pale, very opaque tissue. Deep in the substance of the right lobe was a puckered area about a centimeter in length, roughly quadrangular in outline, with several pale, glistening bands radiating outward; it was deep blue in color at the centre and pale at the periphery. Microscopically it was found that the parenchyma was irregularly divided by delicate bands of badly staining connective tissue, the fibrils of which were pale, fine in texture, and loosely arranged. This tissue was rich in fibroblasts and abundantly infiltrated with round cells. It was most plentiful in the periportal spaces, from which point it sent off narrow trabeculæ of finely fibrillar, cellular connective tissue. These penetrated the lobules for various distances and at irregular intervals, dividing them into fragments of irregular contour. The liver cells were atypical in arrangement, indistinct in outline, pale, swollen, cloudy, and finely granular. In short, the hepatic cells were in a condition of marked cloudy swelling. A few of them were coarsely vacuolated. A very noticeable feature consisted in the frequent occurrence of large and small leukocytic foci lying either in the islands of liver cells or in the connective tissue. In the former situation they were composed very largely of polymorphonuclear leukocytes, among which were numbers of degenerating liver cells, nuclear fragments, and large cells with pale, oval nuclei, representing, probably, desquamated endothelial cells. At the periphery of such cell collections the capillaries contained numerous polymorphonuclear leukocytes. The cell foci in the connective tissue were composed largely of polymorphonuclear leukocytes, but partly of eosinophiles, round cells, and fibroblasts, the two latter elements being, of course, common to the connective tissue throughout. The connective tissue also supported, here and there, thin-walled vascular channels and collections of embryonic bile ducts.

Microscopic examination of the puckered area, mentioned in the description of the naked-eye appearances of the liver, revealed the presence of a matrix of densely cellular connective tissue, embedded in which were numbers of thin-walled bloodvessels. Non-vascular connective tissue prolongations extended outward from the periphery and were gradually lost among the liver cells. In the immediate vicinity the configuration of the liver lobules was greatly altered, and numerous dense collections of round cells were present.

Anatomical diagnosis: Acute parenchymatous degeneration of the heart; hypostasis of the lungs; acute splenitis; acute diffuse nephritis; chronic hemorrhagic gastritis; subacute interstitial pancreatitis; acute and subacute diffuse hepatitis; canalised infarction (?) in the right lobe of the liver; icterus.

Case II.—Female, aged thirty years, married, white, was admitted to the City Hospital, August 11, 1906, and died August 29, 1906.

The patient entered the Hospital complaining of pains in the lower extremities. During the eighteen days that she was under observation her mental condition was such as to render her statements unreliable. It was learned from her husband, however, that she had been accustomed to the excessive use of alcohol for a number of years.

On admission the patient was semidelirious, and gradually lapsed into continuous muttering delirium. The conjunctivæ were of a lemon-yellow tint and the skin of the entire body was faintly jaundiced. Jaundice deepened slightly during the patient's stay in the Hospital, but at no time did it become a very striking feature. The forearms and legs were distinctly atrophied and the hands and feet were helplessly extended. The knee-jerks were not obtainable, and pressure showed tenderness along the line of the larger nerve trunks of the extremities.

The liver was palpable 6 cm. below the right costal margin in the mid-mamillary line and 12 cm. below the xiphoid. The organ was smooth and firm to the touch. The spleen was not felt. On the day of admission the patient's afternoon temperature registered 100.4° F. The following morning it registered 99° F., from which point it gradually rose and assumed a subcontinouus type with average daily variations of about 1.5° F. On the evening of the twelfth day it had reached 103.6° F., falling in the course of the next two days to 100.4° F. It ascended on the evening of the fifteenth day to 103° F. After this the evening temperature always exceeded this point by a fraction, never declining more than a degree in twenty-four hours. The pulse averaged 115 a minute for the first ten days, and gradually increased to about 140 beats to the minute. Death occurred on the eighteenth day.

The urine was dark amber in color, of high specific gravity; albumin and bile were present in considerable quantities; there was no sugar, the urea content was greatly reduced, and neither leucin nor tyrosin was detected. Numerous granular casts were found.

Examination of the blood eight days before death revealed 5,500,000 red cells and 12,200 leukocytes. The following is the differential count of the white cells: Polymorphonuclear, 64 per cent.; small lymphocytes, 34 per cent.; large lymphocytes, 1 per cent.; basophiles, 1 per cent.

On the day before death the red cells numbered 4,480,000 and the leukocytes 20,400. The following differential count of the white cells was made: Polymorphonuclear, 88 per cent.; small lymphocytes, 5 per cent.; large lymphocytes, 6 per cent.; transitional cells, 1 per cent.

No Widal reaction was obtained with the bacillus typhosus.

Autopsy. Thirteen and one-half hours postmortem. The body was 155 cm. in length and the musculature and general nutrition were good. There was considerable atrophy of the forearms and legs. The skin of the entire body was of a greenish-yellow tinge and the conjunctivæ were distinctly yellow. On section the abdominal cavity was dry and the peritoneum did not appear to be changed. The left lobe of the liver was very prominent, its lower edge lying 10 cm. below the tip of the xiphoid. This lobe then disappeared behind the left costal margin, and could be felt lying deep in the left hypochondrium over the spleen. The right lobe was visible beneath the right costal margin.

The spleen lay well behind the left lobe of the liver. It measured 15 cm. in length, 8 cm. in breadth, and about 5 cm. in thickness. The surface was smooth, steel-blue in color, and the organ was flabby. On section it cut readily; the surface was bluish in color and the substance was friable and scraped away easily. The pulp was abundant and bluish in color, the lymph follicles were distinguishable, and the connective tissue was not prominent. Microscopically the pulp was rich in red cells and the blood sinuses were distended. There was a considerable quantity of finely granular pigment scattered over the surface. The lymph follicles were fairly numerous, but small in size and poor in cells, and the vessel walls in the neighborhood were markedly thickened.

The liver was greatly enlarged, measuring 32 cm. from one extreme of the right lobe to the other extreme of the left. The right lobe was very thick anteroposteriorly, and measured 21 cm. from above downward. The left lobe was relatively flattened, but nevertheless thick, and measured 25 cm. from above downward. The organ weighed 2750 grams. The surface was dusky brown in color and perfectly smooth, except for a limited area just above the lower margin of the left lobe, where it was slightly granular on account of the presence under the capsule of a number of small, rounded or oval, bluish elevations. Scattered beneath the capsule of both the right and left lobes were innumerable bright red points or intercommunicating streaks. On section the organ was firm, dull yellow in color, and, for the greater part, the surface was smooth, a few small granular patches appearing here and there. The parenchyma was very irregularly divided into smaller or larger islands of different shapes by bands of grayish tissue, in which small, circumscribed, distinctly reddish bodies were distributed at irregular intervals. The islands of liver tissue were not elevated and their substance was pale and very cloudy.

Microscopically it was found that the changes presented were very irregular in distribution, and that they differed according to the part of the liver examined. Undoubtedly the most striking feature was to be found immediately under the capsule in the areas corresponding to the distribution of the bright red points and intercommunicating streaks and the bluish elevations mentioned in the description of the naked eye appearances of the liver. Here it was evident at a glance that the parenchyma had been replaced in patches by a densely cellular tissue, in the midst of which were large numbers of thin-walled vascular channels filled by well preserved red cells. At first sight this picture conveyed the impression that the vascular channels were neither more nor less than dilated intralobular capillaries. On more detailed inspection, however, particularly after sections had been especially stained and the connective tissue fibrils brought into prominence, it became plain that these masses of tissue were inflammatory in nature, for it was now seen that they consisted of a matrix of delicately fibrillar connective tissue, in the meshes of which were multitudes of round cells, the whole enclosing large numbers of newly formed bloodvessels. The walls of the larger of these vessels, while quite thin, were made up of a connective tissue membrane which was several times again as thick as the normal reticulum of the intralobular capillaries. The inner surface of the vessels was distinctly paved with endothelial cells. In many sections it was not possible to demonstrate the point of origin of this tissue, while in others it obviously commenced in the interlobular connective tissue and thence extended outward to replace the liver lobules.

Deep in the substance of the organ the picture was quite different. Here, in places, the connective tissue was only moderately increased in patches and the liver cells were very fatty, the whole appearance corresponding to that of an ordinary fatty cirrhosis. In other places the lobular formation was well preserved and the connective tissue was not increased, while the liver cells showed advanced cloudy swelling.

In still other places, however, the interlobular connective tissue was considerably increased in quantity, delicately fibrillar and cellular. As one followed its ramifications small groups of thin-walled bloodvessels came into view at scattered intervals. In some instances the connective tissue in the immediate vicinity of these vessels was densely infiltrated by round cells; in other places it was comparatively non-cellular. The distribution of the connective tissue was such that it not only surrounded the liver lobules or portions of them, but insinuated itself between the liver cells, enveloping individual cells or small numbers of cells. The liver cells were thus supported in a complex network of delicate connective tissue fibrils and were made to assume various shapes and sizes. Their cytoplasm was dense, cloudy, and homogeneous. In some places the liver cells were coarsely vacuolated (Fig. 2).

Anatomical diagnosis: Acute parenchymatous degeneration of the heart; hypostasis and emphysema of the lungs; stasis of the spleen; chronic diffuse nephritis; chronic hemorrhagic gastritis; acute and subacute diffuse hepatitis; icterus.

Case III.—Male, aged fifty-two years, white, single, coachman, was admitted to the City Hospital, October 31, 1906.

The patient admitted that he drank three or four glasses of whisky daily, one of which he took before breakfast. He stated that in the midsummer of 1906 his friends had told him that his "eyes were yellow." At the time of his admission to the Hospital, about five months later, the patient's conjunctivæ were faintly jaundiced. During the first thirty-five days that he was under observation jaundice increased slightly in depth, but did not become very noticeable. On the thirty-sixth day the patient had a severe chill lasting one-half hour and preceded by slight fugitive pains in the abdomen.

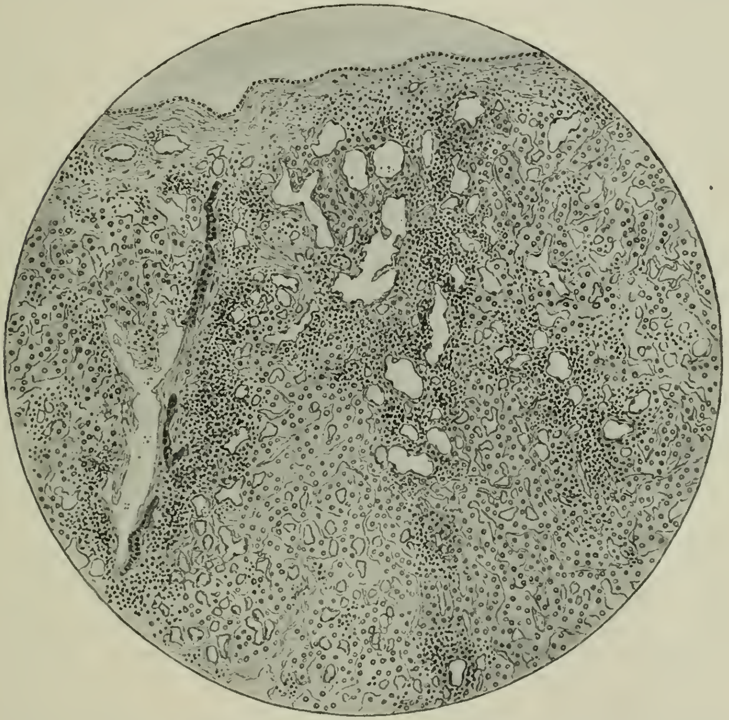

FIG. 2.—Case II. Masses of finely fibrillar, densely cellular connective tissue supporting newly formed bloodvessels, irregularly distributed beneath the capsule and replacing the parenchyma. (The blood cells within the vessels have been omitted in order to preserve the effect.)

After the chill his temperature registered 104° F. Within thirty-six hours jaundice became extreme, and remained so until death occurred, sixteen days later. The day after the chill the patient's temperature fell to 98° F., rose in the evening to 102° F., fell to a point slightly above normal, fluctuated slightly for three days, rose again to 101° F., fell to normal and remained there until death. A few days before death the patient frequently vomited quantities of grumous blood, and similar material was passed in the stools. Examination of the blood on the day of the chill revealed 5800 white cells; six days later the white cells numbered 9000. No malarial organisms were found. The urine was of normal specific gravity and contained bile, albumin, and hyaline casts.

Autopsy. The body was well nourished and 180 cm. in length. The conjunctivæ and the skin of the whole body were deeply jaundiced. The abdomen was dry. The left lobe of the liver occupied the epigastrium. No other part of the organ was visible.

The spleen was firmly adherent to the diaphragm. On removal it was found to be considerably increased in size, and its capsule was everywhere greatly thickened. On section the organ cut firmly and the surface was brownish in color. The interstitial tissue was very prominent, the vessels thickened. The Malpighian bodies could occasionally be made out as small, pale points. The pulp was brownish in color and not readily scraped away. On microscopic examination it was found that the interstitial tissue was markedly increased. The follicles were few in number and poor in cells, the vessels were thickened and, as a rule, showed hyaline changes in their walls and partial or complete obliteration of their lumina. The pulp was very atrophic. Here and there were hemorrhages into the pulp. The blood and lymph sinuses were largely obliterated.

On opening the duodenum and stomach, large amounts of grumous blood were removed. The mucosa of the stomach was extensively eroded, and there were numerous red points scattered over the surface, corresponding to ruptured vessels.

The liver weighed 2250 grams, and was enlarged, firm, the capsule thickened and opaque. At irregular intervals the surface presented groups of closely aggregated, sharply defined granulations, some of which were distinctly reddish in color, others were pale, and still others greenish. Between these roughened areas the surface of the organ was perfectly smooth. On section the liver cut firmly; the cut surface was pale, irregularly granular, and the elevated islands were surrounded by bands of pale, glistening tissue, in which were numerous reddish points.

On microscopic examination it was found that the parenchyma was irregularly cut into islands of various shapes and sizes. These islands were surrounded by broad bands of very loose, delicately fibrillar, actively proliferating connective tissue, which, at frequent intervals, supported groups of apparently newly formed bloodvessels, most of them injected. While throughout the liver the distribution of this cellular connective-tissue was largely confined to the periphery of the islands, the connective tissue elements not infrequently invaded the liver lobules and cut off small numbers of cells, which afterward rapidly disintegrated. It was evident that the formation of connective tissue throughout was recent. At no place was there any sign of old cirrhosis.

In addition to the rich content of round cells and fibroblasts in the connective tissue, a remarkable feature was presented in the occurrence at certain intervals of large or small cell foci made up almost exclusively of polymorphonuclear leukocytes, together with small numbers of eosinophiles. In exceptional instances similar collections were observed within the islands of liver cells.

The liver cells within the islands were irregularly arranged and in a condition of marked cloudy swelling. In many places hemorrhages were to be seen. These occurred most frequently in the lobular remnants, but were occasionally to be seen in the connective tissue. They varied in size from minute, point-like masses of red corpuscles to large collections destroying an entire island or several islands of liver cells. In the better preserved lobules bile precipitation was often to be made out in the liver cells.

Anatomical diagnosis: Acute parenchymatous degeneration of the heart; emphysema and extensive terminal hemorrhages of the lungs; chronic interstitial splenitis, terminal hemorrhages; acute diffuse adenitis; acute diffuse hemorrhagic nephritis; dilatation of the stomach, with widespread erosion of bloodvessels, producing enormous hemorrhage and destruction of the epithelial lining; chronic atrophic interstitial pancreatitis; acute and subacute diffuse hemorrhagic hepatitis; icterus.

Case IV.—Male, aged thirty-nine years, laborer, was admitted to the City Hospital, February 28, 1907; died March 19, 1907.

No satisfactory account of the patient's past history was obtained. He was admitted to the Erysipelas Pavilion because of a fading erysipelas rash on the face and right leg. The temperature was normal. Three days after admission he suffered a severe chill, followed by elevation of temperature to 104.3° F. An erysipelatous patch was now observed on the left cheek. This extended rapidly, and in the course of seven days had involved the face and scalp and the skin of the shoulders and back as far down as a line connecting the angles of the scapulæ. During the first three days of the attack the patient's temperature was constantly above 104° F. It then fell abruptly and fluctuated for several days between 100° and 102° F. Coincident with the pronounced decline in temperature the erysipelas rash began to disappear, and by the fifteenth day had practically gone away entirely. At this moment it was found that, despite the subsidence of erysipelas, the patient's temperature remained between 100° and 102° F., occasionally rising to 103° F., and that the conjunctivæ were jaundiced. Between the fifteenth and nineteenth days jaundice extended rapidly, and finally involved the skin of the entire body. On the day before death the patient complained of pain in the region of the right hypochondrium, and there was tenderness over the liver. Death occurred on the nineteenth day.

Autopsy. The body was well nourished and 180 cm. in length. The conjunctivæ and skin of practically the whole body were distinctly jaundiced. On opening the belly cavity, a quantity of clear, yellowish fluid escaped. The peritoneum was moderately but diffusely thickened and pale.

On opening the pericardial sac, a large quantity of green, cloudy fluid escaped. Both layers of the pericardium were thinly overspread by fibrinous material, especially well marked in the region of the apex. The heart was markedly enlarged, the aortic valves were irregularly thickened and softened, and in places showed considerable loss of substance. The musculature of the heart was pinkish and very cloudy. Microscopic examination of the pericardium showed the usual appearances of an acute fibrinopurulent pericarditis, while the heart muscle was found to be in a condition of intense acute diffuse myocarditis.

The spleen was markedly enlarged. It measured 19 cm. in length, 14 cm. in breadth, and about 10 cm. in thickness, and weighed 870 grams. The capsule was tense, and on section the cut surface was bluish in color, the substance was prominent and friable, the pulp abundant and closely packed, the Malpighian bodies small in size and few in number. Microscopically the changes corresponded to those of acute splenitis, the blood sinuses being engorged and the pulp richly infiltrated with polymorphonuclear leukocytes.

The adrenals were markedly swollen and deep blue in color. Microscopically the changes indicated an intense acute diffuse suprarenal adenitis. On reflecting the descending colon, the finger broke into the body of the left psoas magnus muscle, releasing a large amount of cream-colored pus.

The naked-eye and microscopic appearances of the kidneys corresponded to those of an acute diffuse hemorrhagic nephritis.

The mucosa of the duodenum was swollen and opaque, especially around the opening of the bile papilla, where it was intensely injected. The bile papilla ejected thin watery material after pressure over the gall-bladder. On splitting up the larger bile ducts, it was found that the surface was thinly covered by tenacious mucus. The other structures of the portal space showed no changes to the naked eye.

The liver was enlarged, yellowish in color, and firm in consistency. The capsule was thickened and opaque, and presented numerous distinctly hemorrhagic looking streaks. Distributed over the surface at irregular intervals were groups of pinhead to pea-sized elevations, the individual nodules of which were separated from one another by strips of smooth tissue. Some of these elevated masses were pale, others were brownish, others distinctly red. The surface of the organ between the several groups of nodules was perfectly smooth or faintly undulating. On section the organ cut with difficulty, and the cut surface was rough and covered by numerous scattered, slightly elevated islands of pale tissue surrounded by pale or pink bands.

On microscopic examination it was found that the parenchyma was divided into islands of various sizes and shapes by broad bands of pale, finely fibrillar, very cellular connective tissue. On close inspection it was apparent that, in addition to numbers of round cells and fibroblasts, the connective tissue was richly permeated by polymorphonuclear leukocytes, among which were small numbers of eosinophiles. A few fairly well circumscribed collections of polymorphonuclear leukocytes were observed within the islands of liver cells. Variable numbers of thin-walled bloodvessels could be seen in the connective tissue, and occasionally proliferated bile ducts. The liver cells showed widespread and well-marked cloudy swelling. Bile imbibition within the liver cells occurred at frequent intervals. Hemorrhages into the connective tissue and parenchyma were commonly observed; in the latter situation they often destroyed large masses of liver cells.

Anatomical diagnosis: Chronic peritonitis; acute fibrinopurulent pericarditis; acute diffuse myocarditis; acute splenitis; acute diffuse suprarenal adenitis; abscess of the left psoas muscle; acute diffuse hemorrhagic nephritis; acute duodenitis; acute papillitis; acute catarrhal cholangitis; hemorrhagic gastritis; acute and subacute diffuse hemorrhagic hepatitis; icterus; hydrops of the gall-bladder; ascites.

Case V.—Female, aged forty-two years, was admitted June 5, 1906, and died June 12, 1906.

The patient was a washerwoman, and admitted that she used beer and gin "in moderation." She denied all history of syphilis, but stated that she had had two miscarriages. She was admitted to the Hospital complaining of gnawing sensations in the region of the stomach and nausea and vomiting of five weeks' duration. She said that three weeks before she came into the Hospital she had noticed that her abdomen was becoming larger and that her feet were swollen. On admission she was distinctly jaundiced. During the seven days that she was under observation vomiting was incessant. The abdomen was distended by fluid and the lower limbs œdematous. The abdomen was tapped the day after admission, and a large quantity of clear, straw-colored fluid was removed. After this the liver was palpable 2 cm. below the right costal margin in the parasternal line. The spleen was not felt. The patient's temperature was practically normal throughout. The day after admission the count of the white cells was 17,600; the differential count was normal.

Autopsy. Fifteen hours postmortem. Body poorly nourished. Skin distinctly jaundiced. On opening the abdomen about a liter of deep yellow, slightly turbid fluid was removed, and the peritoneum was found to be diffusely thickened, in places injected. The serous surface of the intestines was irregularly roughened and injected. The left lobe of the liver was visible 3 cm. below the tip of the xiphoid.

The spleen measured 9.5 cm. in length and 5.5 cm. in breadth. The naked-eye and microscopic appearances were those of chronic interstitial splenitis.

The liver was enlarged, pale, and firm, and the capsule was thickened and opaque. The surface was granular at scattered intervals. On section the organ cut firmly and the surface was granular on account of the presence of numerous elevated masses of brownish or yellowish tissue. The spaces between these raised parts were occupied by pale or pinkish bands.

Microscopically the regions corresponding to the periportal spaces were found to be occupied by a network of embryonic connective tissue, which separated the lobules from one another and from which small off-shoots invaded the lobules at irregular intervals and divided them into islands of irregular shape. In some situations the connective tissue appeared as a pale, finely fibrillar, comparatively non-cellular network, but for the most part it was richly permeated by fibroblasts and round cells. In the connective tissue at frequent intervals were collections of cells composed for the most part of polymorphonuclear leukocytes and variable numbers of fibroblasts and round cells. The central portions of such foci were made up almost exclusively of densely aggregated masses of polymorphonuclear leukocytes. At the periphery the cells were fewer in number and less densely packed and consisted of variable proportions of polymorphonuclear leukocytes, round cells, and fibroblasts. These cell foci, however, were not confined to the connective tissue, but were even more frequently to be seen in the islands of liver cells; in fact, scarcely a lobular remnant could be found which had not been invaded to a greater or less extent. In many instances the liver islands were almost entirely replaced by dense collections of well preserved polymorphonuclear leukocytes, among which were degenerate liver cells, free nuclei, nuclear fragments, and desquamated endothelial cells, while at the periphery were numbers of irregularly disposed, pale, swollen, opaque liver cells. In some instances these cell foci were fairly well circumscribed, in other cases a direct connection could be traced between them and similar collections in the surrounding connective tissue. In occasional instances, however, islands of liver cells were found in which there were no evidences of the invasion of leukocytes, and in these places the cells were atypical in arrangement and showed advanced cloudy swelling (Fig. 3).

Anatomical diagnosis: Chronic diffuse peritonitis, mild acute exacerbation; acute parenchymatous degeneration of the heart; chronic interstitial splenitis; acute diffuse nephritis; acute and subacute diffuse hepatitis; icterus; ascites.

Recapitulation. It is obvious that the condition I have attempted to describe is anatomically distinct from chronic atrophic cirrhosis of the liver and from the known acute inflammatory or degenerative lesions of this organ.

In short, the uncomplicated subacute diffuse hepatitis is characterized, anatomically, by enlargement and induration of the liver, with or without the appearance on the surface of irregularly scattered granulations, by cloudy, swollen liver cells, and by the formation of prominent bands of actively proliferating embryonic connective tissue, which are distributed throughout the organ in an extremely irregular fashion. This simple subacute inflammatory lesion may exist without giving rise to definite clinical manifestations, or it may be associated with a clinical picture closely resembling that so often seen in atrophic cirrhosis of the liver. Indeed, the nature of the pathological changes leaves little doubt that, under proper conditions, they could eventually resolve themselves into that familiar lesion. As far as the connective tissue proliferation is concerned, it would seem to represent merely a continuation in a greatly exaggerated degree of the hyperplasia referred to by many authors as the initial step in the production of cirrhosis (Birch-Hirschfeld, Strümpell, and others). The cloudy liver cells, which are a constant feature in the condition I have described, have nothing in common, however, with the liver cells in ordinary cirrhosis.

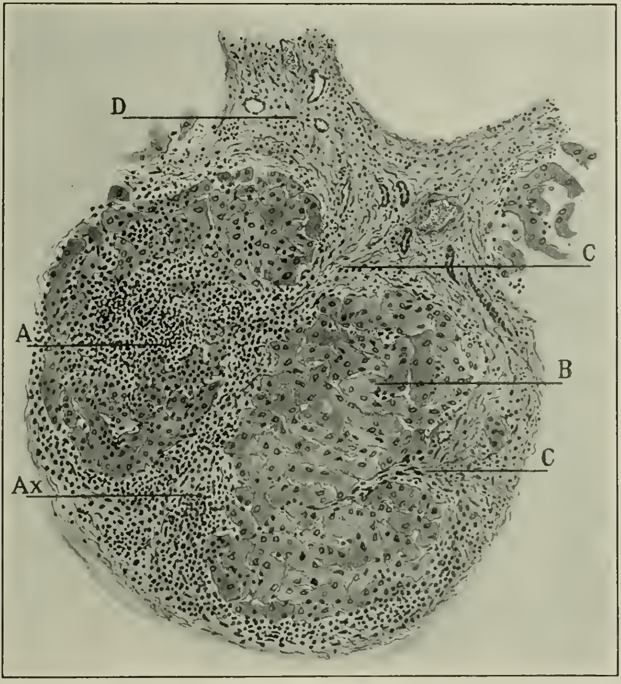

Fig. 3.—Case V. Showing a single lobule. *A*, polymorphonulcear leukocytes within the lobule and at *Ax*, infiltrating the connective tissue; *B*, swollen, cloudy liver cells; *C*, embryonic connective tissue invading the lobule; *D*, finely fibrillar, richly cellular connective tissue in the perilobular space.

When the exudation of polymorphonuclear leukocytes and the occurrence of fresh hemorrhages are associated with anatomical changes in the liver such as have just been pictured, their presence can be interpreted only in the nature of an acute exacerbation. The discovery at the postmortem examination of a definite infective focus outside the liver makes such an interpretation inevitable. Failing this, if such acute changes, occurring in a liver already rendered vulnerable as a result of widespread injury, are associated with acute inflammatory or degenerative lesions in other organs, and clinically with such symptoms as more or less rapidly spreading jaundice, elevation of temperature, vomiting, and mental disturbances, we are justified in assuming that some infective agent has been operative at no very remote period. It is worthy of emphasis that the toxic agent seems to be capable, in some instances at least, of so effecting or furthering changes in the vessel walls that hemorrhages occur, not in the liver alone, but in other organs as well.

If, in view of these considerations, we should endeavor to classify the disease in accordance with the knowledge at our command, it would appear justifiable, both upon anatomical and clinical grounds, to assign it to a place midway between atrophic cirrhosis of the liver and the lesion or group of lesions commonly described under the heading of acute yellow atrophy.

Finally, the occurrence of such cases justifies the conclusion, I think, that a definite anatomical entity exists in the form of a subacute diffuse hepatitis *per se*, and that this lesion is subject to acute exacerbations.

The liver in Case II, especially the occurrence beneath the capsule of vast numbers of irregularly disposed groups of newly formed bloodvessels enclosed in a matrix of finely fibrillar, densely cellular embryonic connective tissue, constitutes, I believe, a unique anatomical lesion. At all events I have not been able to find a similar case described in the literature.

In closing I take great pleasure in acknowledging my gratitude to Dr. Harrison S. Martland for the drawings which accompany this communication. To Dr. Horst Oertel, director of the Strecker Memorial Laboratory, New York, and to my brother, Professor Wm. St. Clair Symmers, of Queen's College, Belfast, Ireland, I am deeply indebted for many valuable suggestions.

A CASE OF UNILATERAL MIXED NYSTAGMUS BENEFITED BY TREATMENT.[1]

By C. A. Veasey, M.D.,
ASSISTANT PROFESSOR OF DISEASES OF THE EYE IN THE JEFFERSON MEDICAL COLLEGE; OPHTHALMIC SURGEON TO THE METHODIST EPISCOPAL HOSPITAL, PHILADELPHIA.

Unilateral nystagmus is exceedingly rare, according to Duane,[2] some 50 or 60 cases only having been reported. Of these, by far the greater number are of the vertical type, Duane's summary being 34 vertical, 11 horizontal, 6 rotary, and 2 mixed. It is in the latter class that the following case belongs.

M. L., a girl aged twelve years, was first examined in April, 1907. There was a convergent concomitant strabismus of 15°, observed first at four years of age, the right being the squinting eye. The vision of the right was 6/7.5; of the left, 6/6. The ophthalmoscopic examination revealed nothing abnormal either in the media or fundi. The child was exceedingly nervous, and for two years had complained of involuntary movements of the right (squinting) eye. She had never observed any diplopia, nor could it be demonstrated, and there had never been noted any similar movements in the left eye, either by herself or by her mother. The ocular excursions were good in all directions, and she could converge to within 3½ inches from the root of the nose. The pupillary reactions and the fields were normal. Binocular single vision was, of course, absent.

With her eyes in a primary position fixing a distant object, the nystagmus was at times mixed (vertical and rotary), at other times vertical only, and again purely rotary. This was demonstrated upon many different occasions. The rotary movements were from right to left; that is, contrary to the movements of the hands of a clock. The nystagmus was not always present, there being periods of rest, but it was always produced by bringing a stranger into the room, or by any other means that would make the child in the least degree nervous. With the eyes rotated upward or downward, the movements were always rotary. When the eyes were directed to the extreme right, the movements were mixed (vertical and rotary); to the extreme left, the movements were vertical only. If the head was tilted toward the right or toward the left shoulder, the movements were mixed. In forced convergence the movements did not differ in character from those observed when the eyes were in the position of rest, but the oscillations were more rapid and more prolonged. The nystagmic excursions were very short and rapid and were not altered by covering either eye.

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[1] Read at a meeting of the Section on Ophthalmology of the College of Physicians of Philadelphia, October 15, 1907.

[2] The Ophthalmic Record, October, 1906.

The refractive error was corrected under atropine, the following being ordered: O. D. + S 2.25 D ○ + C 0.25 D axis 90°; O. S. + S 2.25 D ○ + C 0.50 D axis 90°, this being a half diopter less than the full correction.

After wearing these glasses for several weeks, during which time stereoscopic exercises were employed twice daily, the conditions had materially improved. The squint was now scarcely noticeable, being only about 5°. In the primary position there was now, at times, vertical nystagmus, appearing only when something caused the child to be very nervous. When looking to the extreme right or left, or upon rotating the eyes upward or downward, there were also vertical nystagmic movements. The movements now, however, always ceased as soon as the left (non-nystagmic) eye was covered. When the left eye was covered there was always an immediate slight outward movement of the right, in order to fix the object, and just as soon as this was accomplished the nystagmus ceased. There was no nystagmus now in forced accommodation until the point beyond which the eyes could converge was passed (3½ inches). In other words, so long as the patient employed the left eye for fixation there were periods of nystagmic movements in the right if the child became nervous, but whenever the right eye was used as the fixing eye all movements ceased and, under this condition, could not be induced.

This result is similar in some respects to that obtained in the case reported by Verhoeff before the American Ophthalmological Society at its last meeting. The paper, I believe, has not yet been published, but if I remember the case correctly, he had corrected the squint as far as possible by an operation, and then placed in front of the non-nystagmic eye a convex lens so strong (an addition of 1.50 D to the regular correction) that the patient could not see clearly through it for distance, being, therefore, compelled to employ the nystagmic eye, and under these conditions all nystagmic movements ceased. When the patient attempted to read, however, which could be done through the added lens, nystagmic movements were produced.

REVIEWS.

Human Anatomy, Including Structure and Development, and Practical Considerations. By Thomas Dwight, M.D., LL.D., Parkman Professor of Anatomy in Harvard University; Carl A. Hamann, M.D., Professor of Anatomy in the Western Reserve University; J. Playfair McMurrich, Ph.D., Professor of Anatomy in the University of Michigan; George A. Piersol, M.D., Sc.D., Professor of Anatomy in the University of Pennsylvania; and J. William White, M.D., Ph.D., LL.D., John Rhea Barton Professor of Surgery in the University of Pennsylvania. With 1734 illustrations, of which 1522 are original, and largely from dissections by John C. Heisler, M.D., Professor of Anatomy in the Medico-Chirurgical College, Philadelphia. Edited by George A. Piersol. Pp. 2088. Philadelphia and London: J. B. Lippincott Company, 1907.

"What," said Melancthon, "can be more ignominious than for a man not to know the structure and composition of his own body?" If this opinion of the great medieval scholar be true of man in general, the value of a knowledge of anatomy to those whose lives are devoted to the cure of bodily ailments cannot be expressed. That a knowledge of anatomy was to be gained only by the long practice of dissections, was the opinion of Vesalius; but the medical student today finds in his crowded curriculum all too little time for dissection, and it is necessary to supplement the practical work not only with didactic instruction, but by the provision of a text-book where may be found answers to all questions which might arise in the student's mind as his knowledge of anatomy is increased by vocal instruction and manual investigation. The preparation of the present work was undertaken, the editor tells us, "with three chief considerations in mind. (1) The presentation of the essential facts of human anatomy, regarded in its broadest sense, by a descriptive text, which, while concise, should be sufficiently comprehensive to include all that is necessary for a thorough understanding not only of the gross appearances and relations of the various parts of the human body, but also of their structure and development. (2) Adequate emphasis and explanation of the many and varied relations of anatomical details to the conditions claiming the attention of the physician and surgeon. (3) The elucidation of such text by illustrations that should portray actual dissections and preparations with fidelity and realism."

The accounts of the skeleton, including the joints, and of the gastropulmonary system and of the accessory organs of nutrition have been written by Dr. Dwight; Dr. Hamann has contributed the account of the cerebrospinal and sympathetic nerves; Professor McMurrich has supplied the systematic description of the muscular system and of the blood and lymph vascular system. Dr. Piersol has written the introductory, histological, and embryological paragraphs throughout the work; has contributed the description of the central nervous system and of the urogenital system; and, in his capacity as editor, has welded the various contributions into a homogeneous whole. The practical considerations have been contributed by Dr. J. William White, and the illustrations for this portion of the work have been made largely from dissections supplied by Prof. Gwilym G. Davis. The illustrations for the anatomical sections themselves have been drawn by the Messrs Faber from dissections by Prof. Heisler. The histological and embryological drawings are by Mr. Louis Schmidt.

The greatest departure in Piersol's *Anatomy* from the characteristics of other anatomies, contemporaneous and past, is in the amount of space (nearly one-fifth of the work) devoted to practical considerations. This is truly a sign of the times. Applied anatomy has gradually come to be regarded no longer as a mere appendage to systematic anatomy, but as a correlative branch—as the higher development of theoretical knowledge already gained; indeed some who are called enthusiasts dare to look forward to a day when applied anatomy will hold a much more important place in the curriculum of our medical schools than it does at present. The older surgeons, who received only systematic instruction in anatomy, found it desirable to work up the practical aspects of the anatomy of those regions in which they were particularly interested; and we have inherited their knowledge, and reverence their pioneer labors by attaching their names to the regions and structures they investigated. We thus speak of the triangles of Scarpa, of Petit, of Hesselbach; of the fascia propria and the ligamenta suspensoria of Sir Astley Cooper; of Hunter's canal; of Colles' fascia; of the ligaments of Poupart, Gimbernat, and Hey; of the aponeurosis of Denonvilliers, of Nélaton's line, etc., etc. Whatever may be the opinion as to the wisdom of attempting to combine applied with systematic anatomy in one bulky volume, there can be little unfavorable criticism directed to the manner in which the author of the practical considerations has accomplished the task assigned. In spite of the amount of matter contained in this portion of the work, the applications are, in many instances, rather suggested than expressly described, thus developing in the student a faculty for seeking for further practical applications himself, but at the same time giving him ample foundations on which to build his superstructure. The influence of the forms of the bones, the architecture of the joints, and the action of the muscles, are described in relation to fractures and dislocations; the lymphatics and facial planes are considered in reference to inflammatory and cancerous metastases; while in the discussion of the nervous system, the thoracic and abdominal organs, and the genito-urinary tract, the character of the practical considerations embraces not only surgical affections, but many of a medical nature as well. There is, however, this unavoidable drawback, that few topics can be fully discussed in one place; for example, certain practical considerations on fractures and luxations are discussed in connection with the bones, certain other features with joints, certain others with muscles, and so on.

The illustrations, also, in that they are practically all drawn originally for this work, mark a distinct era in the publication of anatomical text-books in the English language. It is true that the early editions of Gray's *Anatomy* were illustrated almost entirely by original cuts; but no other anatomy can boast the wealth and variety of illustration which Dr. Piersol has presented to his readers; and when it is remembered that this variety is not obtained by the insertion of drawings copied from Spalteholz, Testut, Quain, Henle, Zuckerkandl, and other European authors, one begins to appreciate the value of the volume now before us. Dr. Piersol, in his preface, rather lays stress on the fact that his illustrations are not diagrammatic, but that they faithfully record the preparations and dissections as they actually appear; and we think the only legitimate criticism, and one which we offer with due deference to the contrary opinion of others, is that the actual appearance of even the most skilfully made dissection is less easily interpreted by the average student than is a semidiagrammatic reconstruction of the preparation, such as was furnished, for instance, by the original wood-cuts of Gray. There can be no question, however, of the superiority, from an artistic standpoint, of the illustrations in Piersol's *Anatomy*. And as ". . . . *opere in longo fas est obrepere somnum,*" it will not, we hope, be considered invidious if we point out a few—a very few—lapses from the usual high standard presented by most of the illustrations. The fault to which we refer, and it is a fault which is no doubt even more apparent to the professed artist than to the casual observer, is a lack of what is known as "modelling" in certain of the illustrations (for example, in Figs. 241, 364, 598, 1630), on account of which the more distant surfaces of the dissection are made to appear to lie on the same plane with, if not even in front of, those structures which should be in the foreground. As we have said, the artists themselves, no doubt, have been the first to appreciate this peculiar appearance, which is possibly due to the process of reproduction, and which can readily be corrected when once it is observed.

The main text of the work probably affords the most scientific, accurate, comprehensive, and, for a single volume, the most exhaustive account of human anatomy to be found in the English language. Dr. Piersol, whose editorial ability has rarely been surpassed, has exercised such a judicious and tireless supervision over the articles of his collaborators, that no overlapping is to be found, no hiatuses exist, and cross references in the text are always inserted where desirable. The scientific attitude of mind which inspires him permeates the entire work. Considerable stress is laid throughout on comparative anatomy, for it is well recognized by the editor that without the knowledge of *why* a thing is thus and so, anatomy bebecomes a mere matter of memory.

Dr. Dwight draws on his rare familiarity with comparative anatomy with the happiest results in the sections devoted to the bones and joints. Much matter of an encyclopedic character is included, of utmost value to many advanced students and specialists; and it is refreshing to learn so much of morphology from an original source.

Prof. McMurrich has made a brave attempt to present a scientific classification of the muscles on a morphological or embryological basis. Owing to its novelty, it is somewhat difficult for the reader to find his way around at first, but further acquaintance will no doubt render this easier. Although Prof. McMurrich is forced to abandon his classification in certain regions, owing to the present limits of embryological knowledge, it is none the less a praiseworthy attempt to bring order out of chaos. Prof. McMurrich discountenances the view that the lymph capillaries open directly out of the so-called lymph spaces in the cellular tissues. He holds that the lymphatic system is closed, except for its connection with the subclavian veins. This view is not indorsed by the writer of the practical considerations; and the editor evidently finds it difficult to decide where doctors disagree.

That portion of the work devoted to the nervous system is particularly complete, both as regards the text (which occupies nearly 400 pages) and the illustrations. These sections are followed by descriptions of the skin and its appendages, and of the organs of special sense. The gastropulmonary system is next described, the alimentary tract, peritoneum, and practical considerations on hernia being discussed in 275 pages; while the organs of respiration are dismissed in 56. Accounts of the urogenital system, including the male and female reproductive organs, conclude the volume.

It is said that Laurembergius, professor at Rostock in the seventeenth century, boasted that he had found more than two thousand errors in the Anatomy of his rival Laurentius. We venture the assertion that it will be difficult to discover as many as two errors in the present work. It is truly a *magnum opus*; more than that, it is a *κτῆμα ἐς ἀεί*. Familiarity, instead of breeding contempt, will but enhance its value in the possessor's mind, since he will be more able to find what he desires to know (the present index is not sufficient); as text-book, reference book, encyclopedia, it is not equalled by any single volume now in existence. A. P. C. A.

MODERN MEDICINE. ITS THEORY AND PRACTICE. In original contributions by American and foreign authors. Edited by WILLIAM OSLER, M.D., Regius Professor of Medicine in Oxford University, England. Assisted by THOMAS MCCREA, M.D., Associate Professor of Medicine and Clinical Therapeutics in Johns Hopkins University, Baltimore. In seven octavo volumes; Volume II; pp. 828; 69 illustrations. Philadelphia and New York: Lea Brothers & Co., 1907.

THE second volume of Osler's *Modern Medicine* is devoted to that large and important group of diseases known as the infections. It opens with an eminently appropriate and well written introduction to the study of infectious diseases by Ludwig Hektoen, who describes in a lucid manner the general nature and specificness of the infectious diseases, the biological characteristics of the infectious agents, the ways and means of infection, the nature of the resistance offered by the human body, and antitoxins, lysins, opsonins, precipitins, agglutinins, etc. The chapter is altogether worthy of its author, and should prove of much value to the alert general practitioner desirous of keeping abreast of the times.

Among the many infectious diseases discussed in the volume, two probably will enlist general interest—typhoid fever and pneumonia. The article on typhoid fever is by Thomas McCrae, and comprises 161 pages. It is a noteworthy contribution, reflecting not only the author's own large experience, but also that of the Johns Hopkins Hospital physicians in general, and constituting a masterly account of a disease universal in its distribution and protean in its manifestations. The discussion of the treatment is quite practical; the bath treatment, of course, is preferred; the diet suggested is restricted rather than generous (in opposition to the tendencies of some physicians); the use of large amounts of water internally is urged; and drugs are advised only for special indications; indeed, the motif of the chapter on treatment is Nathan Smith's statement, "It does not follow, of course, that the disease in all cases requires remedies, or that a patient should necessarily take medicines because he has the disease."

The article on lobar or croupous pneumonia is by John H. Musser and George W. Norris, and comprises 110 pages. It is based upon the authors' wide and varied experience and upon a careful statistical and other study of the literature. It is comprehensive, complete, authoritative, eminently graphic in the discussion of the symptomatology, and practical in suggestions in treatment. Especial attention is devoted to the value of hydrotherapeutic measures and the rationale of their use; the importance of large amounts of water internally in combating the toxemia; the necessity of promoting elimination; the value of stimulants, when needed (the use of alcohol is commended); and the question of diet.

The account of scarlet fever and diphtheria has been contributed by John H. McCollom, than whom no one is more competent. The chapters, reflecting his experience, are authoritative and may well be looked upon as comprising all of importance that is really known of the diseases in question. It is interesting to observe that, in discussing the differential diagnosis of scarlet fever, Dr. McCollom expresses his disbelief in the existence of a so-called fourth or Duke's disease. His discussion of the treatment of diphtheria is particularly illuminating, and should be read by all practitioners; it shows well what can be accomplished by the use of antitoxin, not only in the direct cure of the disease, but in the virtual substitution of intubation for tracheotomy in the severest cases of laryngeal diphtheria, etc.

There are many other excellent contributions: On smallpox and chicken-pox, by William T. Councilman, which contains a full account of the supposed parasitic cause of the disease, an account of much interest, though not entirely convincing, by one who has devoted much time and energy to elucidating the etiological factors of the disease; on vaccination, by George Dock, which contains statistical and other matter that should be of interest to our friends the antivaccinationists, though doubtless they will disavow the convincing array of facts in favor of vaccination and revaccination; on measles, rubella, whooping-cough, and mumps, by John Ruhräh, who also expresses doubt regarding the existence of the so-called fourth disease; on influenza, by Frederick R. Lord; on dengue, by Thomas T. Coleman; on epidemic cerebrospinal meningitis, by Henry Koplik; on erysipelas, by James M. Anders; on toxemia, septicemia, and pyemia, by Richard M. Pearce; on rheumatic fever, by Frederick J. Poynton, who has done much work in regard to the supposed bacterial nature of the disease; on cholera, by W. P. Dunbar; on yellow fever, by James Carroll, whose work in elucidating the nature of the disease and its mode of transmission by the mosquito is well remembered, and whose recent death is much lamented; on plague, by W. J. Calvert; and on bacillary dysentery, by K. Shiga, the pioneer in proving the bacillary nature of one form of dysentery.

The volume is a worthy member of an excellent family, and is to be unreservedly commended. A. K.

The Practice of Obstetrics by American Authors. Edited by Charles Jewett, M.D., Professor of Obstetrics and Gynecology in the Long Island College Hospital, New York. Third edition. Pp. 820; 484 illustrations. New York and Philadelphia: Lea Brothers & Co., 1907.

In the space at our disposal an extended review of this book is impossible, and as the profession has already given a favorable verdict to the two earlier editions, it indeed is unnecessary. The present volume is well balanced, and while there are opinions expressed in one portion only to be contradicted in other parts of the work, we are glad to say that this defect is not glaring. Of course, we find certain teachings with which we are not in accord. This is unavoidable, and, moreover, with but few exceptions, our differences are dependent upon the individual viewpoint, the result of personal experience, and are, therefore, unsuitable for discussion here.

We are pleased with the conciseness of expression and the general definiteness of the teaching given, and we note with pleasure that, while the book is sufficiently illustrated, it is not weighted down with useless pictures. We heartily congratulate the authors upon the inclusion of a fair amount of bibliography, an item which greatly enhances the value of a volume upon a scientific subject. While we have been impressed with the uniform excellence of the work as a whole, both in its scope and in the detail of its execution, there are several portions which have especially appealed to us, among others the section devoted to extra-uterine pregnancy, which includes a suitable consideration of the advanced case; the pages given to the toxemias of pregnancy; the section upon the diagnosis of pregnancy, which is most satisfactory in its completeness; and the very excellent twenty pages devoted to fœtal anomalies—a scientific presentation of the greatest value.

We profess an opposition to systems of medicine, believing the book written by one man of ripe experience to be preferable; but, if a composite book is desired, we can recommend the one before us, since we consider it to be the best yet published. W. R. N.

The Diagnosis and Treatment of Diseases of Women. By Harry Sturgeon Crossen, M.D., Clinical Professor of Gynecology, Washington University, St. Louis, Mo. Pp. 800; 700 illustrations. St. Louis: C. V. Mosby Medical Book and Publishing Company, 1907.

Our first impression of this book, gained from its title and the large number of illustrations, was distinctly unfavorable. We have previously inveighed against the picture-book method of teaching gynecology, and we are not enthusiastic with regard to the value of a book limited to the consideration of diagnosis and treatment; but it gives us pleasure to recant from our position in so far as the present volume is concerned, and to make amends by heartily recommending it. As implied in the title, the only subjects considered are the diagnosis and treatment of gynecological affections. Our only criticism is that we believe the value of the work would have been greatly increased by including pathology as well. Aside from this we have nothing but praise for the painstaking work of the author. The greater portion of the 700 illustrations have been obtained from the works of other writers, to whom full credit is given. The text is concise, but sufficient for its purpose. Major operative procedures are considered only in a subsidiary manner, while the procedures required of the general medical attendant are carefully described. We believe that the book will meet with a favorable reception, filling as it does a vacant niche in the library of the general practitioner. W. R. N.

The Hygiene of Nerves and Mind in Health and Disease. By August Forel, M.D. Authorized translation from the second German edition by Herbert Austin Aikins, Ph.D. Pp. 343. New York and London: G. P. Putnam's Sons, 1907.

This is another volume of the *Science Series* and is supposed to be an exposition of the hygienic conditions in relation to the nervous system. In the preface it is stated that for such a task as this Prof. Forel has very unusual qualifications, for as a psychologist, especially in the field of instinct and hypnotism, he has a world-wide reputation. This is unquestionably true, and therefore the more surprising that he should write a book of this sort, which can in no way be any credit to him. It is rather difficult to understand how any layman, for evidently the book has been written for laymen, can understand its contents. It is subdivided into three parts: In the first are discussed the mind, brain, and nerves in the normal condition. In this are included five chapters, the total making one hundred and thirty-nine pages. Here are discussed psychology (the science of the mind), the anatomy of the nervous system, the relation of the mind to the brain, the physiology and the embryology, and the race history of the nervous system. The second part includes the pathology of the nervous life, and encompassed in about one hundred pages are discussed the general conceptions of nerves and mental pathology, the synopsis of mental and nervous diseases or abnormalities, and the causes of mental and nervous disturbances. The third part is devoted to the hygiene of mental life and of the nervous system, to which the rest of the book is dedicated. In this part are treated nervous hygiene in general, the nervous hygiene of inheritance, the nervous hygiene of development or of childhood, and, lastly, that of adults.

One can readily appreciate that in a book whose object is to expose the principles of the hygiene of nervous diseases it is hardly necessary to discuss the relation of the mind to the brain or to know what are spirit and mind. It is rather questionable whether a knowledge of the general conceptions of the pathology of the nervous system may be of benefit. The trouble with books like these is that they fall into the hands of people who are hardly prepared to read and digest the contents with any comprehension, and the general result is that they do more harm than good. It is, of course, true that the public at large has very little conception of the character of nervous and mental diseases, and it would be an excellent thing if the public could be taught that the presence of insanity in a family is not a source of degradation. This book, however, will not accomplish this. So far as hygiene is concerned it is hardly necessary to have a special form for the nervous system, since hygiene is not as yet to be divided into specialties. T. H. W.

OPHTHALMIA NEONATORUM, WITH ESPECIAL REFERENCE TO ITS CAUSATION AND PREVENTION. (The Middlemore Prize Essay of the British Medical Association, 1907.) By SYDNEY STEPHENSON, M.B., C.M., Ophthalmic Surgeon to Queen Charlotte's Hospital, London. London: The Ophthalmoscope Press, George Putnam & Sons, Limited, 1907.

THIS is an excellent monograph, exhaustive, judicious, and interesting, upon the most important disease in the whole realm of ophthalmology. The author develops the subject upon the following general lines: Neisser's discovery of the gonococcus has placed this disease and allied affections upon a thoroughly scientific basis. That a connection existed between fluor albus in the mother and ophthalmia in the child was recognized by some as early as the middle of the 18th century. It is now known that the discharge from the eyes contains gonococci in from 50 to 66 per cent. A milder type of inflammation occurs without the latter organism, but associated with several other kinds of pyogenic germs (pneumococcus, staphylococcus, streptococcus, bacterium coli, etc.); sometimes micrococci are altogether absent. Both eyes are attacked, as a rule. But the author's own experience, as well as that of others quoted, shows that it is not so rarely limited to one eye as is frequently stated. Arthritis is an important septic complication; serous membranes are rarely affected, even general sepsis ending fatally has been observed. "Billard's sign" that is, a narrow transverse red line in the centre of the upper lid, is stated to mark the first beginning of the ophthalmia.

The affection must be distinguished from lacrymal disease and keratomalacia. Microscopic examination of the pus, the author thinks, should never be omitted. The author by no means shares the optimism contained in the opinion that a good prognosis is always justified if the cornea be clear when the baby comes under medical care. Gibson, who recognized the connection between the maternal disease and ophthalmia in 1807, gave directions for prevention which cannot be bettered at the present day. Credé's method is unequivocally endorsed (1 per cent. solution of silver) and the objections to it are correctly pronounced unimportant, but notification, instruction of students and midwives, education of the public, etc., should not be omitted.

In the treatment of the disease the author does not depart from generally recognized principles, such as the destruction of the gonococci locally, particularly by the salts of silver and the proper removal of the discharge by a non-irritating fluid. T. B. S.

The Review of the American Practice of Surgery, Vol. II, Published in the American Journal of the Medical Sciences, September, 1907, Vol. CXXXIV, p. 427.

My attention has recently been called to the statement in the above mentioned review that my "descriptions of traumatic or emphysematous gangrene and of hospital gangrene are particularly graphic. Perhaps this is to be attributed to the fact that they are taken bodily, with little verbal change, and with no credit, from the pages of Ashhurst's *Surgery*." This has led me carefully to re-read and compare my article with those of Professor Ashhurst on the same subjects. I find that in 101 pages—almost 4000 lines—covered by my article on "Gangrene and Gangrenous Diseases," I have used in regard to the two subjects alluded to (occupying ten and a half pages), 61 lines taken from Ashhurst's *Surgery*, and elsewhere in my article 36 additional lines, most of them somewhat changed verbally but still obviously derived from that source.

While surgery is a progressive science, there is much that, although it is necessary to mention it in a comprehensive article, has become classical rather than practical, and especially is this true of virtually extinct diseases like hospital gangrene, for the facts concerning which we of the younger generation must turn to the writings of our teachers and of their teachers. I regret that in doing this—as the verbal changes often precluded the use of quotation marks—I did not at least put "(Ashhurst)" at the end of such paragraphs as I owed to him.

I believe a careful search through and comparison between the writings of many authors, of much more distinction than I am likely to attain, would show, throughout the history of medical literature, a tacitly accepted custom of employing certain forms of expression to describe conditions unchanging through the years, and, to one unpossessed of great literary ability, difficult of characterization in absolutely new or original language.

The late Professor Ashhurst, my former teacher and one of the leaders of his profession, was a man of great punctiliousness and accuracy. No one would accuse him of plagiarism or of doing what was not in accordance with the highest sense of professional honor, yet having been led by the reviewer's mention of his name in this connection to compare his surgery with that of Mr. Erichsen, previously published, I find that he made very similar use of the writings of his predecessor on these same subjects, as appears by Erichsen (third edition, 1861), pp. 107, 108, 394, 395, and Ashhurst (fifth edition, 1889), pp. 155, 156, 433, 434, and many other pages. The resemblance, both as to words and lines of thought, is often very close. Professor Ashhurst also followed with equal closeness the plan, headings, divisions, subdivisions, and teachings of his distinguished English predecessor. Neither on these pages nor in the preface—of the fifth edition at least—is any acknowledgment of indebtedness to Mr. Erichsen to be found.

The reviewer's thought that "my personal experience with gangrene appears to have been confined to a single case" might occur to a casual reader, but he is well aware that I have been connected with several large Philadelphia hospitals for many years, and he also knows that, therefore, I have had the opportunity of observing many cases of such varieties of gangrene as are still to be seen. He further states that I make this case "do duty, (1) as gangrene due to arteriosclerosis (p. 214); (2) as diabetic gangrene (Plate XII); and (3) as emphysematous gangrene (p. 252)." The description which is on the page opposite the illustration of this case shows that it well exemplified the three conditions. It might have been called any one of the three forms, but, as a matter of fact, it is shown merely as a case of "gangrene of the foot," and it corroborates forcibly the claim made throughout the article that in the great majority of instances gangrene depends not upon a single cause, but upon the simultaneous action of two or more pathological conditions. A multiplication of such expensive color plates could not possibly have brought out so well the interdependence of these conditions, and could have given no better pictorial representation of them. The same underlying fact—of intimate correlation as to causes—explains the "repetitions" of which he complains. Any description of diabetic gangrene without free reference to the subject of arterial sclerosis or atheroma would be incomplete; similarly, any discussion of senile gangrene without reference to the prominent part played by traumatisms, even though slight, local lesions, etc., would be valueless.

In offering the foregoing, I have endeavored to avoid the appearance of controversy, by omitting reference to all matter of opinion, and by confining myself entirely to facts that any reader may verify for himself.

ALFRED C. WOOD.

I have read the foregoing communication from Dr. A. C. Wood. When writing the review, I carefully considered my words; and having again referred to the notes made at that time, I am willing to let the review stand as published. In regard to the suggested resemblances between Ashhurst's *Surgery* and that of Erichsen, it should be well known that, having published an American edition of Erichsen in 1869, Professor Ashhurst, when publishing his own *Surgery* in 1871, cordially acknowledged in the preface his indebtedness to the distinguished British surgeon for both the plan and many of the details of his own work.

A. P. C. A.

I have read the reviewer's reply to my communication. I confined myself to facts, none of which he contradicts; and I employed neither the *suggestio falsi* nor the *suppressio veri*. I used Professor Ashhurst's name (introduced into the review by the reviewer) to illustrate, and to justify, a custom which I believe to be not uncommon. I limited myself to the edition of Ashhurst's *Surgery* under my hand, which was sufficient for the purpose. I might have included the second (1878), third (1882), fourth (1885), and sixth (1893) editions, but desired to avoid even the appearance of unkindly criticism. I repeat now that the custom in question seems to me compatible with high standards of professional honor, and I have no intention of "suggesting" anything else.

ALFRED C. WOOD.

PROGRESS

OF

MEDICAL SCIENCE.

MEDICINE.

UNDER THE CHARGE OF

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Pulmonary Tuberculosis and Induced Abortion.—Von Amstel (*Beiträge zur Klinik der Tuberkulose,* 1907, vii, 79) has collated a most profuse array of opinions bearing upon the influence of pregnancy, and labor, on the course of pulmonary tuberculosis, and the advisability of producing abortion. The article really consists of quotation heaped on quotation and is valuable through the grouping of an almost endless number of views upon this important subject. He points out, to begin with, that the laws of most countries make abortion punishable, without defining any exceptions. Jurists assure him that it would, of course, be impossible to convict a physician who performed an abortion to save the life of the mother, but the technical plea must resort to the unwritten law or to casuistic juggling of the statutes. One cannot be guaranteed immunity from an unsavory prosecution. In some countries, however, as in certain cantons of Switzerland, qualifying clauses are appended, "to prevent a greater evil to save the life of the mother," etc. Treub has urged that the law be sensibly modified or entirely stricken out. Unfortunately, even medical opinion varies widely as to the exact indications for abortion, and the attempt to arrive at some standard by instituting regulating boards has been unavailing. Medical men must decide a given case according to their own consciences, although the advice always given and usually followed is to have a consultant, not so much from a desire to have a partner in responsibility as to have additional light thrown upon an important matter. To show how widely apart honest opinions may stand, they point to Maragliano, who considers the presence of tuberculosis in the mother an absolute indication for the production of an abortion, and Pinard, who would allow an abortion only when the pregnancy itself is the menace to life, and advises to nurse the tuberculous patient carefully and allow the pregnancy to take its course. There are many moot questions which come up for consideration in a discussion of abortion in pulmonary tuberculosis.

In regard to the progeny, they are probably, as a rule, born free from tuberculosis. While germinal infection may be possible, and placental infection very frequently does occur, Baumgartner, alone of prominent writers, ascribes any very great importance to congenital tuberculosis. Numerous statistics show, however, that only a small number of children of tuberculous mothers reach puberty, most dying in the first few years of life. The prevailing opinion is that postnatal and not antenatal infection plays the prominent role. There is at present a strong French school, prominent in which is Landouzy, which is insistently urging the view that tuberculous antecedents are an important factor in the production of various hereditary malformations, laying especial emphasis upon the frailty and lack of resistance of children of the tuberculous. At any rate, it may be confidently asserted that such children are less likely to reach adult age. As regards the mother, it is now universally admitted that pregnancy exercises a most baneful influence upon the course of pulmonary tuberculosis, and statistics, as well as general experience, show that in cases in which abortion is performed, particularly when performed early, the course is much more favorable. Labor and the puerperium are times of even greater danger than pregnancy itself. It is a matter of universal comment how frequently a quiescent or unsuspected lesion will become active and rapidly spread during pregnancy or the puerperium. It is astonishing how many tuberculous women date their illness from childbirth.

It would not be possible even to indicate the various views which prevail as to the advisability of producing abortion in tuberculosis. The medical principles are clear, and the discussion revolves about the relative rights of the mother and the child. The two extreme views have been quoted. Some would perform abortion only in early cases in which there is a prospect of ultimate arrest. Others would wait until it became evident that the pregnancy was injuring the mother; others, until the child is viable. However, to put off the operation until so late a time would defeat the object for which it is undertaken. Von Amstel's conclusions in summing up his considerations are these: If the tuberculous woman wishes to marry, she should be warned of the danger and advised against it. If she is married, facultative sterility should be practised. If she is pregnant, the dangers of her condition should be explained and abortion urged. The earlier and more favorable the tuberculous lesion, the more positive the indication. The only exception he makes is in far advanced cases in which the operation can be of no possible good to the mother.

The Interpretation of the Positive Venous Pulse.—A. W. Hewlett (*Jour. Medical Research*, 1907, xvii, 119) observes that: (1) A positive wave of the venous pulse during ventricular systole may be due to at least three different causes: (*a*) simultaneous contraction of the auricles and ventricles; (*b*) tricuspid insufficiency; and (*c*) paralysis of the auricles. (2) Simultaneous contraction of the auricles and ventricles causes, or tends to cause, the V-wave to disappear from the tracing owing to auricular diastole. (3) Tricuspid insufficiency produces a large V-wave, which appears abnormally early. In marked cases there is a gradual ascent in a tracing from the auricular wave to the summit of the V-wave. (4) In absolutely irregular pulses the auricles have ceased to contract. The positive venous wave of early ventricular systole is produced by the contraction of the ventricle, and is transmitted unchanged through the motionless right auricle to the veins of the neck. Normally, this wave is taken up by the dilating auricle. (5) Tricuspid insufficiency does not necessarily accompany auricular paralysis, and when it does so its diagnosis is difficult, for the reason that in both conditions the V-wave appears early, owing to the excess of blood in the right auricle.

Method of Measuring the Venous Pressure without a Manometer.—George Oliver (*Quarterly Med. Jour.*, 1907, i, 59) notes that "if the veins on the dorsum of the hand are sufficiently visible, it is found that when the hand is held in a vertical position, with the fingers extended, and is very gradually raised, the veins at a certain height above the level of the apex of the heart are seen to collapse quite suddenly. The completion of the process is quite definite, for the transition from a partial to a complete collapse takes place within the space of a half-inch." At the moment of collapse the blood pressure within them (the veins) is nil, being balanced by the force of gravity. We may therefore express this force, annulling the hydrostatic rise of blood in mm. of Hg. In calculating results we multiply by 2 (or approximately the number of mm. of Hg representing the pressure in one inch of blood) the number of inches above the level of the apex of the heart at which the veins collapse, thus ascertaining in mm. of Hg the venous pressure. Oliver says that this method has afforded him excellent results, it being important to see that the pressure is not artificially raised, as by nervousness, obstruction by tight clothing, or touching the forearm, or lowered by the affects of cold.

The Pathogenesis of Pernicious Anemia with Particular Reference to Bothriocephalus Anemia.—Tallqvist (*Ztschr. f. klin. Med.*, 1907, lxi, 427).—The etiology of pernicious anemia is still unknown. Its definition depends upon a blood picture which is itself not distinctive, but occurs as a secondary feature in the course of other diseases. Chief among these are certain parasitic infections of the intestines. A thorough understanding then of the conditions under which they produce the blood changes of pernicious anemia may give valuable suggestions as to the origin of the disease. Passing the exhaustive review of the literature with which Tallqvist introduces his article, we begin at once with a brief report of his interesting experiments with Bothriocephalus latus. Infection with this worm is exceedingly common in Finland, yet relatively few of its hosts develop severe anemia. The coincidental view advanced by Bloch is rejected as an inadequate explanation, and the object of the experiments is to find under what conditions the anemia is produced. In a study of the worms it is found that when fresh specimens are extracted with water or sodium chloride solution the filtrate has no effect upon blood. When, however, the segments are macerated, the resulting mixture displays very pronounced hemolytic and hemagglutinating properties, and contains, besides, a proteolytic ferment and a substance restricting the action of pepsin and tyrosin. When the segments are placed in water they rapidly disintegrate and become dissolved, forming an emulsion-like mixture. This action occurs independently of bacteria and depends upon an inherent autolytic action. When such an emulsion is filtered the hemolytic substance remains entirely in the mass, while the agglutinin and the ferment pass entirely through with the filtrate. These two latter substances cannot be definitely separated, but, under varying conditions, one may be preserved and the other destroyed, showing their independence.

The hemolytic substance is insoluble in water or sodium chloride solution. It may be extracted and dissolved in alcohol and ether, and presents other fat-like properties. This lipoid substance is closely united to the albuminous portion of the worm, and its full effect is exercised only when set free by disintegration of the proteid by digestion. Under these conditions it is as active as the alcohol or ether extract. The substance produces no antibodies. Hemolysis proceeds without hemoglobin destruction. Red blood corpuscles from all sources are affected, but the intensity of this action varies widely. Rabbits, guinea-pigs, man, dogs, horses, cattle, goats, chickens, and pigeons are arranged in the order of their susceptibility. The hemolytic action is quite marked. For example, 8 cm. of a 2 per cent. suspension of horses' red corpuscles shows complete hemolysis with 0.001 gram of the substance. Extraction and weighing show that the lipoid substance forms about $\frac{1}{10}$ of the dried mass of the worm. All experiments indicate that it is an integral part of the worm body and not a secretion.

The hemagglutinin likewise forms an integral part of the worm body. It is soluble in water and is thermolabile. When once destroyed by heat it cannot be reactivated by the addition of complement. The agglutinin has a strong affinity for certain red blood corpuscles. Corpuscles from the horse, for instance, combine fifty times the lowest active amount. The agglutinated corpuscles become much less resistant to mechanical influences. The substance is not uniformly active, corpuscles from many animals being unaffected. The most sensitive to its action are human red blood corpuscles. The agglutinin forms an antibody when injected into animals. It is easily destroyed by acids and by pepsin and trypsin digestion. It displays no agglutinating action toward bacteria. The enzyme is a proteolytic ferment, very labile, and cannot be preserved for any length of time, making its examination difficult. It works most actively at a temperature between 35° and 40°, and is destroyed at 60° C. It is soluble in water, and acts best in a slightly acid medium. It dissolves coagulated egg albumin and muscle and liquefies gelatin. The filtrate, as was said, shows an inhibiting action on pepsin and trypsin. This action is strongest the shorter the time the animal has been dead. At 100° C. the inhibiting action is much reduced but not entirely lost. This antifermentative substance is quite distinct from the autolytic substance. Examination of worms coming from cases of severe anemia shows that these contain the same substances that are found in worms from other sources, and no new specific product can be found. What is striking about the worms from anemic cases is their small size and the evidences of marked disintegration. The dried material per given length is also much reduced. The procentual relation of the various substances remains the same, but the lipoid substance seems freer and unites more easily with the red blood corpuscles. This suggests that in cases with anemia some factor occurs leading to death of the worm, and that by autodigestion the lipoid substance becomes more easily absorbable. Tæniæ show neither an agglutinin nor a hemolytic substance. Experiments with the sera of various animals show that they all contain, in varying degrees, a certain inhibitory action upon the hemolytic substance and upon the agglutinin and ferment. This reaction Tallqvist thinks is more probably a physical than a chemical one. Animal experiments with these various substances give the following results: Intraperitoneal injection of the self-digested worm substance *in toto* causes definite anemia and marked constitutional symptoms in rabbits. The albuminous agglutinating substance injected alone causes the same grave toxic symptoms, but only a transient anemia. When the agglutinin is administered by mouth there is absolutely no reaction. It is probable that it is not absorbed from the intestinal canal of patients with bothriocephalus, as their serum fails to show the presence of any antibody. This seems to exclude it as the important factor in the production of the anemia. The lipoid substance injected intravenously causes anemia and has a toxic action which bears a distinct relation to its action upon the red corpuscles. Subcutaneous injections and administration of small doses frequently repeated produce a definite anemia which has many of the characters observed in cases of pernicious anemia. The hemoglobin is relatively high, the number of leukocytes is decreased, and there is a relative lymphocytosis. Nucleated red cells appear as well as microcytes and macrocytes. There is poikilocytosis and marked polychromatophilia. The anemia, too, shows a decidely remittent course, and at autopsy there is siderosis of the liver and spleen and lymphoid metaplasia of the marrow.

After this exhaustive study of the properties of the substance of the bothriocephalus, Tallqvist applies his observation to the interpretation of primary anemias. Numerous observers have demonstrated the presence of hemolytic substances similar in action to the lipoid material of bothriocephalus in many normal organs, particularly in the mucous membrane of the digestive tract and in some of its glands. The almost constant presence of grave changes in the digestive tract in primary anemia leads him to suggest that certain quantitative and qualitative changes in fat conversion may exist, perhaps a pathologically increased excretion of the hemolytic lipoid substance, which acts as the toxic agent. Similar substances have been described, too, in malignant tumors, and may be the cause of the accompanying anemia, particularly of the intense anemia so frequently associated with gastric cancer.

The Histopathological Diagnosis of Affections of the Liver and Spleen.—F. SCHUPFER (*Semaine médicale,* 1907, xxvii, 229).—It is difficult in many instances to determine the exact condition of the liver and spleen by direct clinical methods. Schupfer accordingly proposes puncture by a small hollow needle or trocar and examination of the small piece of tissue obtained. This exploratory puncture was first proposed in 1895 by Lucatello. The possible traumatism caused by the earlier methods of puncture led Lucatello to devise a newer form of needle and method of extraction of the bits of tissue. The needle is 8 cm. in length with an exterior diameter of 1.8 to 2 mm. and an interior diameter of 1.4 to 1.5 mm. The tip is cut slanting and the walls taper to a fine cut edge. A small glass syringe is attached to the needle, and during the withdrawal of it mild aspiration is practised by the syringe, this facilitating the extraction of plugs of tissue which are about 1 mm. in width and 1 to 2 cm. in length, a size sufficient for pathological study. Complete sterilization is most important, and the needle should be perfectly dry, as tissue adheres better under these circumstances than when the interior of the needle is moist. Methods of preparing the tissue for study are given by the author, who has by means of this puncture been unable to differentiate many conditions in the liver and spleen. The diagnosis of different forms of cirrhosis, the differentiation of lesions from primary tumors of the liver and spleen, or from malignant metastases, are examples of the assistance which this method has afforded him. Liver abscess is frequently diagnosticated, while in Banti's disease the needle allows inspection of the hepatic condition when the advisability of splenectomy is under consideration, as well as the ultimate result after the removal of the spleen. It can be used in tumors elsewhere than in the liver and spleen, though in these conditions the situation of the tumor and other circumstances may contraindicate puncture.

(The reviewer would warn against the use of these methods in large, soft, hyperplastic spleens. The danger of fatal hemorrhage as a result of exploratory aspiration of acute splenic tumor has more than once been demonstrated.—W. S. T.)

Roentgen-ray Treatment of Syringomyelia.—E. BEAUJARD and J. LHERMITTE (*Semaine médicale,* 1907, xxvii, 193) say that former measures in the treatment of this serious condition have only been palliative and for the relief of symptoms. The causal lesion has entirely escaped benefit, a fatal termination coming on inevitably. But recently the employment of the *x*-rays has completely modified this bad outlook and changed considerably the clinical history. The authors' 4 cases and 6 others reported from the literature form the basis of this article. One case especially was followed carefully throughout the entire course of the disease, and in this treatment showed the most remarkable results. The treatment started in May, 1906, with weekly applications of the *x*-rays to the spine (the dose was 3 H. units, of 7 to 9 penetrating power, and the tube held 15 cm. from the skin). Altogether 26 exposures were given, with occasional remissions to avoid a dermatitis. Even from the third treatment a marked amelioration of the sensory symptoms was noted, and there was steady improvement until complete recovery. The rays were applied to each side of the median line, thus covering the cord most thoroughly. A study of the sensory disturbances would indicate the exact region of the spine which requires treatment, but the sound regions should be included also. Parts not treated or those to be treated later he thinks should be protected. The motor disturbances seem to be influenced first, and later the muscular strength gradually returns. Finally, the trophic disturbances disappear and the restoration of the sensations of heat, contact, and pain follows. Advanced muscular atrophy is little affected, but beginning atrophy and weakness are markedly influenced.

SURGERY.

UNDER THE CHARGE OF

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Late Secondary Nephritis.—Levy-Franckel (*Annales des maladies des organes genito-urinaires*, 1907, xxv, 1392) says that the recognized varieties of syphilitic nephritis are: (1) An acute form occurring in the second stage, characterized by an enormous albuminuria (20 to 50 grams or more in twenty-four hours), and by its appearance during the full efflorescence of the secondary symptoms; and (2) a tertiary nephritis, rarely acute, more frequently an interstitial nephritis, occurring ten, twenty, or thirty years after the chancre. Often this is accompanied by tertiary symptoms. Besides these there is a somewhat special form, distinguished from the acute secondary by its evolution and symptoms, and from the tertiary by its time of appearance in the course of syphilis. It shows some special characteristics. It does not coincide with the appearance of the secondary symptoms. In contrast with the precocious form, the quantity of albumin is relatively small and does not generally reach 8 grams in the twenty-four hours. It appears from two to three years after the chancre. Another special characteristic is the insufficiency of milk diet and diuretic treatment. The symptoms persist and are aggravated under this *regime*, and yield only to mercury or mercurial iodide. This treatment seems to act with remarkable activity. In one case, after six injections of 2 c.c. of benzoate of mercury, the ascites ceased to be reformed. The difficulty in diagnosis is to be accounted for chiefly by the fact that as the symptoms occur after the cutaneous manifestations of syphilis and at times in the course of ignored syphilis, one does not think of the specificity of the affection.

Actinomycosis of the Appendix.—Short (*Lancet*, 1907, ii, 760) says that actinomycosis of the vermiform appendix was first recognized by Barth in 1890, and was first recognized in England in 1892 by Ransom. Since attention has been directed to actinomycosis in the right iliac fossa it has become evident that a number of cases really originate in the cecum, and an identical clinical picture may result after perforation. Hence a preferable title would be "actinomycotic perityphlitis." Three cases have come under Short's care in the last year, and he describes three more from the annals of the Bristol Royal Infirmary. Grill mentions 77 cases of actinomycotic perityphlitis as recorded up to 1895. In 1904, Löwe, of Greifswald, referred to 68 cases, but as he gives the names of only a few of the original publishers, it is impossible to say how many are included in both lists. Short has found 27 cases described since Löwe's paper, so it is probable that the total number is about 150, of which 27 are English. It is highly improbable that the nature of the disease will be realized unless search is made for the granules, and even then they are frequently absent from fecal or chronic sinuses in undoubted cases. The proportion as to the sexes is about 5 males to 2 females. It is more frequently seen between twenty and thirty years of age. A large number of the sufferers are connected in some way with farm life or deal with corn. Hinglais describes the symptoms as occurring in four stages: (1) The initial stage of visceral manifestations, consisting of vague pains in the right iliac fossa, sometimes associated with intractable diarrhœa; (2) the stage of tumor formation; (3) the stage of fistula formation, usually lasting for months; subphrenic or pulmonary abscesses form and the patient dies of hectic fever and exhaustion. In some cases, however, there is (4) a stage of cicatrization, in which the fistula closes and a cure follows. Unhappily this is often only temporary. More than two-thirds of the subjects die, and even those reported cured are liable to a relapse. The disease is usually miserably chronic and may last for years. If possible the cecum and neighboring bowel should be sacrificed for a thorough removal of the disease. Usually all that can be done is to open abscesses as they point, and to give internal remedies, as potassium iodide, etc.

A Case of Catarrhal Appendicitis due to the Presence of Oxyuris Vermicularis.—Garrod and Fairbanks (*Lancet*, 1907, ii, 772), on opening the appendix in a case of supposed appendicitis, found some soft fecal matter and several thread worms. Thirty-six hours after operation the temperature was normal, but on the fourth day the temperature rose to 103.8°, and the child had an attack similar to that before operation. This lasted three days and was followed by uninterrupted recovery, the wound healing by first intention.

Novocain as a Lumbar Spinal Anesthetic.—Füster (*Deut. Ztschr. f. Chir.*, 1907, xc, 225) says that novocain employed in a dose of 0.1 gram is decidedly more analgesic than tropacocain. It is at the same time less poisonous, and, therefore, gives fewer dangerous symptoms and sequels. Failure occurs in about the same proportion with both preparations. The percentage of failures may be reduced by more careful attention to the indications for its use, especially with reference to the age of the patients. Although perfection has not yet been attained even with novocain, without doubt this preparation gives such good results that it more nearly than tropacocain concurs in efficiency with the inhalation methods. With more careful selection of cases and more strict observation of the contraindications (under fifteen years of age, suppurative processes, and marked general cachexia) we possess in novocain an almost harmless preparation. Füster recommends the drug, exclusively, in the form of tablets, and in no case the solution.

Bone Transplantation in Extensive Defects of Continuity in Long Bones.—Tomita (*Deut. Ztschr. f. Chir.*, 1907, xc, 247) says that autoplastic and homoplastic methods are suitable to the filling in of extensive defects in continuity of the long bones. In removing a piece of bone for transplantation its periosteum and medulla should be saved. It should be large enough and should be fixed carefully in place. The cicatricial connective tissue should be excised as completely as possible. A sharp separation, therefore, is important, so that no bruising of the tissue may occur. Hemorrhage must be completely stopped. The skin wound should be closed, or only a small part should be left open for the introduction of gauze drainage for a few days. An intact large piece of bone taken from the same individual retains its viability so long that it consolidates well with the fragment. Animal bone, even the periosteum itself, shows no outgrowths and appears to aid little in the formation of callus from the ends of the fragments. The periosteum on a piece of bone taken from the same individual adheres quickly to the soft parts. A fresh piece of bone, whether it is taken from the same individual or from an animal, heals well even if it is rather large. When the healing of the wound is disturbed, a piece of bone taken from the same individual will still occasionally possess the ability to take hold after being repelled by partial necrosis. The transplanted piece of animal bone in the human body must naturally die and be absorbed, because foreign bone cells as such cannot live. But living bone-connective tissue heals in the human body better than dead bone and soon gives a solid support. This is gradually replaced by human bone through callus formation.

Separation of the Acetabular Epiphysis of the Femur: Its Relation to Adolescent Coxa Vara.—SARGENT and KISCH (*Lancet*, 1907, ii, 14) says that separation of the acetabular epiphysis is now regarded as of not infrequent occurrence, and that it is usually diagnosticated by the skiagraph. He says further that the view has been gradually adopted that all cases of adolescent coxa vara have had a previous separation of the epiphysis. A peculiarity of the case here reported is that it presents a condition of recent separation of the right acetabular epiphysis without any knowledge on the part of the patient that there was anything wrong with the right hip joint. The patient is an epileptic, nineteen years old. He said that he had a fit in bed, and when he woke the next morning his left hip was painful and he was unable to walk properly. On more careful inquiry, it was found that he had fallen out of bed in a fit about a year ago, and some time later he found that his hip was not quite right, and he was told that he limped. He has never had any sensation or pain in the right hip. On examination there were physical signs of coxa vara in the left hip, but not in the right. Skiagrams show separation of both upper epiphyses, more marked on the right side. During the last six years 10 cases with the diagnosis of "separated acetabular epiphysis" have been admitted to St. Thomas' Hospital. It is believed that traumatic coxa vara and ordinary adolescent coxa vara, that is, all cases of adolescent coxa vara, are due to a previous separation of the epiphysis.

Two Cases of Intermittent Hydronephrosis Treated by Operation.—CHEYNE (*Lancet*, 1907, ii, 11) reports 1 case, in which the cause was a high insertion of the ureter into the pelvis of the kidney. This resulted in a valve-like closure of the opening as the pelvis filled with urine. An incision was made into the pelvis of the kidney about one-half inch to one side of the ureter and extending upward around it, and the state of the interior of the pelvis was investigated. The orifice of the ureter was then slit together with the adjacent wall of the pelvis as far downward as they were adherent to each other, thus increasing the orifice of the ureter. As this did not give the desired result, the original incision in the wall of the pelvis was continued around the ureter at about one-half inch from the ureter, or slightly less in the lower portion, so that the ureter was detached with an oval portion of the pelvic wall. An opening was then made in the lower part of the pelvis, and the ureter with the detached pelvic wall was inserted and sutured into this opening, the mucous membrane being avoided by the sutures. Some of the redundant pelvic wall at the upper part was cut away, and the edges being inverted the pelvis was closed by catgut sutures. The results of this operation were, that the orifice of the ureter was attached to the lower part of the pelvis, its opening was enlarged and no longer valvular, and there was a direct flow of urine from the pelvis to the ureter. The later progress of the case was uneventful. In the second case, the same condition was found at operation and the same procedure was carried out. Twelve days after the operation, however, during violent movements in bed, some part of the union between the pelvis and ureter must have given way, with leakage of urine into the loin. This was evacuated by incision. A month later the flow of urine from the wound had ceased and the drainage tube was left out. Two weeks afterward the patient left the hospital well.

The Prognosis and Technique of Gastro-enterostomy.—Helferich (*Deut. Ztschr. für Chir.*, 1907, xc, 360) calls attention to the influence which the consequent inflammation at the seat of operation may have in causing adhesions of the neighboring serous surfaces. As a result, displacement and contraction, or even occlusion, of the stomach communication with the efferent loop of intestine may occur. The symptoms of vicious circle may develop, not on account of an incorrect insertion of the intestinal opening into the stomach wound and a troublesome valve-like mechanism due to the disposition of the mesentery, but simply to closure of the efferent intestine in spite of its correct insertion. Helferich has observed several cases of this kind, but reports only one. Upon the development of symptoms of a vicious circle after a gastro-enterostomy for constriction of the pylorus by perigastric inflammation, Helferich reopened the abdomen. He found the efferent loop of intestine adherent to the colon, mesocolon, and mesentery. The adhesions were freed without any further disturbance of the anastomotic opening. In order to hinder the redevelopment of the adhesions the patient was raised to a semi-recumbent position and he was given large quantities of fluid to make the efferent loop as movable and passable as possible. Except for some disturbance in the first two days resulting from the sitting position, the patient recovered without gastric symptoms, and left the hospital seventeen days after the second operation. Helferich has made it a rule after a posterior gastro-enterostomy, before the patient is brought back to bed, to raise him somewhat in bed to overcome the pressure backward on the field of operation and to favor the normal readjustment of the intestinal coils. Later he further raises the patient toward the sitting position.

Bone Formation in the Human Penis.—FRANGENHEIM (*Deut. Ztsch. für Chir.*, 1907, xc, 480), as a result of his study of the subject says, that bone formation in the penis should not be regarded as the end result of a chronic inflammation. Sigmund observed it as a complete ossification of the lymph vessels. Others, especially the older writers, compared it with the formation of phleboliths. Waelsch considered the cord formation as a chronic phlebitis and periphlebitis, taking its origin from the dorsal vein of the penis. The plate-formed calcifications found by Robineau, and by the author compared to tracheal rings, lie, according to Waelsch, in the course of the inferior veins of the corpora cavernosa, which run in a curve around the lateral surfaces of the penis to the deep dorsal veins. Ossifications in the human penis are not remarkable when we take into consideration the fact that there is no tissue or organ in the body in which it has not occurred occasionally, and that not always in old age. So long as these facts are not explained, there is no reason to associate bone formation in the human penis with the penis bones of the lower animals.

Asthenozo-ospermia, Azo-ospermia, and Aspermia.—FRANK (*Ann. des maladies des organes génito-urinaires*, 1907, xxv, 1601) says that the best proof that azoöspermia and asthenozoöspermia should not be regarded as rare pathologial phenomena is found in the fact that they have been established in about 25 to 30 per cent. of cadavers. In rare cases aspermia is associated. Investigations in sterile married people have shown that azoöspermia exists in from 30 to 70 per cent. This is due in most cases to gonorrheal involvement and occlusion of the spermatic duct. The usual seat of trouble is in the tail of the epididymis. It has been shown by recorded cases and experiments on the lower animals that, in spite of such obstruction, the specific activity of the testicles is not interrupted. After ligature or resection of the spermatic duct in the lower animals, as dogs, the animals showed normal sexual excitement and performed coitus like others not so treated. After removal of the testicles, however, the sexual instinct rapidly diminished. The products of testicular activity in a short time are absorbed, and thus the vitality of the organ is preserved. This explains why after years none of the phenomena consecutive to the loss of both testicles manifest themselves. Fürbringer says that in double gonorrhœal epididymitis the chances are 9 to 1 that azoöspermia will be present. It is difficult to find in the literature statistics on the frequency of epididymitis in gonorrhœa. Finger found epididymitis 211 times in 3136 cases of gonorrhœa. Of 344 cases of epididymitis found in the literature there was azoöspermia in 302. Simmonds concluded that a third of the cases of sterile marriages are caused by azoöspermia consecutive to gonorrhœa. Gonorrhœal infections of the prostate or seminal vesicles can produce a similar result, the spermatozoids being destroyed by the action of the pus. Oligozoöspermia results from a partial destruction of the spermatozoids and asthenospermia from the resulting lowered vitality of the living spermatozoids. The small canals of the tail of the epididymis have been shown to contain cylindrical secretory cells. It has also been shown that the secretions of these cells play a physiological role similar to that of the seminal vesicles and prostate in aiding the movements of the spermatozoids from the beginning of the vas deferens to the seminal vesicles. If the tail of the epididymis is removed, even if the canal is reunited, the progress of the spermatozoids is probably prevented.

Since it is generally admitted that there can be no hope of the cure of azoöspermia, Frank prefers that we prevent its appearance as far as possible. If it is not possible by early treatment to avoid epididymitis, we should devote all our efforts to its relief as soon as it appears, that is, in the acute period. Finger says that the subjective signs of inflammation disappear very rapidly under applications of ice. The considerable firm infiltration, however, remain and offer great resistance to its resorption. Frank has treated with encouraging results all his cases for eight years with a high degree of heat. He employs a special apparatus fixed in the suspensory bandage for applying the heat, which is maintained by an electric current.

The Relation of Traumatism to Appendicitis.—Guinard (*Arch. gén. de Chir.*, 1907, i, 341) presented before the Paris Surgical Society 4 cases in which a relation was shown between traumatism and appendicitis. In the first case, a young man, an attack of appendicitis occurred two months after he had been kicked by a horse in the right iliac fossa. Six months later he had a second, and on the third attack, at the end of two years, he was operated on. The inflamed appendix showed only ordinary lesions. There had been no signs of appendicitis before the accident. The second case was a boy, who was kicked by a mule in the abdomen, and three months later he had his first light attack of appendicitis. Four months later there was another attack. Operation was performed in the interval and showed ordinary lesions in the appendix. The third case was that of a young man, who fell on his right flank, with resulting pain in the right iliac fossa and swelling. Operation showed an enormous hematoma, in the middle of which was the appendix absolutely sound. The writer suggests that adhesions following a traumatism may kink or constrict the appendix, decreasing its resistance against infection. The fourth patient had a gangrenous appendix containing a blackish infected fluid. There was no preceding history of abdominal trouble. Four days before he had received a violent blow in the right iliac fossa. The pulse and temperature were normal and the general condition good. Guinard thinks that in this case, which is exceptional, the traumatism produced a contusion with crushing of the appendix and resulting gangrene.

Cancer Infection and Cancer Recurrence: A Danger to Avoid in Cancer Operations.—Ryall (*Lancet*, 1907, ii, 1311) believes that the usual cause of recurrence of cancer in the field of operation is not the result of inadequate operation, but of cancer infection of the wound at the time of the operation. There can be no reason to doubt that cancer cells liberated at the time of operation are capable of becoming implanted in the wound and developing into fresh malignant growths. Not enough importance is attached to this in the clinical teaching of the present time. The widespread dissemination of secondary cancer growths in the peritoneum is to be explained only by the fact that the cancer cell is highly infective and capable of implantation in circumstances which are perhaps particularly favorable to its growth in the abdomen. The cancer cells, becoming parted from the parent growth, are set free in the peritoneal cavity and are carried about by the movements of peristalsis or even by the force of gravity, or perhaps their movements are aided by the ascitic fluid which is so frequently found in these cases. Where they become implanted they take on active growth and cause this widespread infection. There must also be a similar proneness for liberated cells to implant themselves in an operative wound.

THERAPEUTICS.

UNDER THE CHARGE OF
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The Treatment of Malaria in Children.—Crespin (*La province médicale*, 1907, 24, 303) advises the administration of quinine, by mouth if there is no gastric disturbance, hypodermatically in the presence of digestive symptoms. The taste of the drug may be disguised by giving it encased in sugar or chocolate, in albolene or one of the fixed oils; it may be followed by a little lemon juice. Solutions for hypodermatic administrations should be largely diluted, and it is better to employ several injections of small size than a single large one. A useful formula consists of 35 to 45 grains of quinine bichloride to 150 minims of water. To this 30 grains of antipyrine may be added to increase the solubility of the quinine salt and to lessen the pain of the injection. The maximum dose for a child under two years is 7½ minims; from two to five, 15 minims; from five to ten, 22 minims; from ten to fifteen, 30 minims. The tasteless quinine compounds, euquinine and aristochine, may be substituted for quinine for mouth administration. Certain adjuvants, notably arsenic, will materially increase the good effect of the quinine, and cryogenine is useful as an antipyretic in instances of hyperpyrexia, but has no influence on the infection. Laxatives are beneficial when the fever has disappeared and the digestion is sluggish and the liver and spleen are congested. In chronic malaria hydrotherapeutic measures may be employed, but douches over the splenic region may induce a malarial paroxysm. Splenic hypertrophy in children may be subjected to radiotherapy. In hemoglobinuria quinine should be given only in small doses and injections of artificial serum may be administered in order to supply mineral matter to the blood.

Renal Decapsulation in Eclampsia.—De Bovis (*La semaine médicale*, 1907, x, 109) has successfully treated a patient, in whom the ordinary forms of treatment had wholly failed, by decapsulation of the right kidney. Previous to the operation the patient had suffered from repeated convulsions. After recovery from the anesthesia a considerable quantity of urine containing albumin was passed, but this manifestation disappeared completely within a few days. The particular point of interest is that this is the first instance of cure of eclampsia following the decapsulation of a single kidney.

The Treatment of Infantile Convulsions.—According to Weill (*Journal de médecine de Paris,* 1907, xix, 26, 249), in addition to the usual means, chloroform inhalations, hot baths, ice-bags to the head, etc., we may employ, during the paroxysm, compression of the carotids, alternating between the right and the left if the convulsions are general; if they are unilateral the carotid of the opposite side should be subjected to the pressure, the compression being maintained for about four seconds at a time; the seizures should become less and less frequent as well as less intense after each compression. Leeches may be applied to the mastoid and malleolar regions. The injection of 1 to 2 ounces of artificial serum two or three times daily may be beneficial in eclamptic seizures with fever, dryness of the mucous membranes, dysuria, etc. In asphyxic spasms oxygen inhalations are advised and in laryngospasm rhythmical traction of the tongue and titillation of the pharynx may relieve the condition. In safeguarding the patient against recurrences our chief resources are hydrated chloral, the bromides, and antipyrine. The action of chloral is very rapid and the dosage for a newly born infant is $\frac{4}{1000}$ to $\frac{7}{1000}$ grain; for a nursling, from $\frac{7}{1000}$ to $\frac{1}{50}$ grain; such doses may be given three to five times daily; the rectal dose is double the above. The bromides may be given in doses of 15 to 45 grains per day. The child should be kept in as quiet a state as possible; proper feeding is very important and physical fatigue should be avoided.

Bismuth Subnitrate in Gastropathies.—Hayem (*La quinzaine thérapeutique,* 1907, viii, 218) is an enthusiastic advocate of the use of bismuth subnitrate in stomach lesions. It is the agent of choice in ulcer, in which it hastens healing and lessens the pain and vomiting. In the pain of hyperchlorhydria the bismuth salt is far preferable to sodium bicarbonate, since the latter is not curative, but aggravates the disordered chemistry of the stomach which causes the pain. Likewise the bismuth relieves all forms of gastralgia when of organic origin, no matter what the chemical defect in the secretion of the organ may be. In ulcerating cancer it relieves the pain markedly, but unfortunately here the pain recurs when the medication is stopped. Not only is bismuth effective against pain, but it also relieves the sialorrhœa, emesis, and spasm of ulcer; it likewise relieves simple aërophagia, but is ineffective in the hysterical type of this affection. The best mode of administration is in doses of from 4 to 5 drams once daily. Small doses are less active and are more likely to cause constipation, though three doses a day of from 75 to 90 grains may be employed. When one dose daily is prescribed it should be taken ten to fifteen minutes before breakfast suspended in about a third of a glass of water. Administration of the bismuth, 5 drams in a half-pint of water, through the tube after lavage is advisable in some instances.

Morphine in Cardiac Dyspnœa.—Hay (*The Practitioner*, 1907, lxxix, 487) states that morphine is of recognized value in the treatment of cardiac dyspnœa, a fact easily recognized when one appreciates the fact that dyspnœa is largely subjective and that its severity bears no direct relation to the frequency of respiration or cardiac pulsation. Cardiac dyspnœa may be associated with two entirely different phases of arterial blood pressure, and in both of these morphine is useful. In patients with low pressure the trouble is primarily valvular. For these patients, when there is muscular failure, the morphine should be combined with digitalin or digitalin and atropine in order to tone the failing myocardium and at the same time to relieve the subjective sensations of dyspnœa. If the blood pressure is high, probably over 200 mm. of mercury, the morphine should be combined with a vasodilator, given by the mouth or hypodermatically. The drugs of the nitrite group and ammonium hippurate may be employed here.

Atropine in Acute Morphine Poisoning.—Koch (*Klin.-thera. Woch.*, 1907, xiv, 737) has studied the action of these drugs upon men and animals and makes the following statements concerning them. In many instances of atropine poisoning enormous doses of morphine can be given, which shows at least that atropine is antagonistic to morphine. Reports of instances of mixed poisoning exist in which the morphine has been prevented from exerting its narcotic effect and its depressory action upon respiration. Numerous instances of morphine poisoning have been treated with belladonna and atropine and especially significant are those in which marked and rapid betterment has followed the hypodermatic administration of the latter. The instances in which atropine had no action or did harm may be explained upon the ground of improper administration of the antidote. In retrospect it would seem that atropine given in not too large doses, but still in sufficient quantity, is to be relied upon. The proper dosage would seem to be $\frac{1}{30}$ of a grain, given hypodermatically and repeated at intervals of sufficient length. The drug should be stopped as soon as the contracted pupil begins to dilate, this being the sign that the organism has received enough. In morphine intoxication atropine should not be our only resource, but other agents, such as caffeine, strychnine etc., and especially those which act upon the respiratory centre, should be employed.

Physostigmine Salicylate in the Prevention of Postoperative Intestinal Atony.—Vineberg (*Surgery, Gynecology, and Obstetrics*, 1907, v, 184) considers that this drug is of some value in this connection; its use is free from danger and worthy an extended trial, and it would seem to be of especial value in counteracting the probable paralyzing effect upon the intestine of the morphine which most patients need during the first few hours after a laparotomy. Vineberg's patients received the physostigmine salicylate with the initial dose of morphine just as they were recovering from the effect of the anesthetic; 15 of the 37 patients observed experienced no need for an enema to relieve distention before the fourth day after operation, when they received a purgative; 1 patient expelled flatus in thirty hours; 4 patients needed an enema within twenty-four hours; to 3 an enema was given in thirty hours, to

3 in forty-two hours, to 7 in forty-eight hours, to 3 in seventy-two hours. Of 55 patients who received no physostigmine after operation the percentage of those who called for relief was much greater. The danger of the drug, in the author's opinion, is not so great as some observers believe; these consider that the peristalsis which it causes might, in the presence of small and unrecognized injuries to the intestine, be attended with serious results. Harm may also ensue when meteorism is already present, or when it is due to mechanical obstruction or peritonitis.

Antitoxin in Diphtheritic Paralyses.—PERRIN (*Revue médical de l'Est*, 1907, 11, 356) cites an instance of diphtheritic sensory and motor polyneuritis affecting all four limbs and raises the question as to whether this complication would have supervened if the patient had been subjected to systematic antitoxin treatment after the nervous manifestations had begun. He considers that in this patient rapid relief would have ensued if injections of antidiphtheritic serum had been given frequently —say, every two or three days. Such frequent injections as these, however, should not be practised without precautions, for repeated injections, especially if the doses are large, may induce untoward effects. The patient should be kept on a fluid diet, the channels of elimination should be kept freely open, and upon the least sign of untoward reaction the injections should be stopped. Haushalter is quoted as having observed a series of experiments which lead him to think that antitoxin treatment is of decided value in the prevention of diphtheritic paralysis.

Veronal in Seasickness.—SCHEPELMANN (*Therapeutische Monatshefte*, 1907, xxi, 406), after an experience with a number of patients, concludes that in veronal we have a useful means of preventing and relieving seasickness. As a prophylactic he prescribes the drug in doses of 7½ grains; in the height of the ailment he gives 30 grains daily, if necessary, in divided doses of from 10 to 15 grains each. Certain patients under this treatment feel no symptoms of seasickness and are able to eat with gusto and to go about the deck at will; others are relieved of headache and nausea, but continue to suffer from vertigo and lack of appetite; in a few subjects the treatment is unavailing. If severe emesis is present the veronal is given by rectum in double the oral dosage, the drug being soluble in 150 parts of hot water. It seldom exhibits any cumulative effect, and, the therapeutic dose being much less than the toxic dose, no symptoms of poisoning are likely to be observed.

PEDIATRICS.

UNDER THE CHARGE OF
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Differential Diagnosis Between Measles and Rubella.—H. M. McCLANAHAN (*Jour. Amer. Med. Assoc.*, 1907, xlix, 1916) thus sums up the differential diagnosis of measles and rubella. Measles always has a cough, and it is usually characteristic; conjunctivitis is nearly always present; pharyngitis is always present and the soft palate is always implicated; the fever is intermittent; a strong light and careful inspection will always reveal Koplik's spots. The prodromal symptoms vary in degree; they precede the rash for from three to five days, and may send the patient to bed. The rash is maculopapular, and begins on the forehead and face; it spreads all over the body in forty-eight hours; the papules are at first discrete, then fuse, but always leave irregular patches of normal skin between them; the rash begins to fade on the third day; it takes longer to disappear than in rubella. The temperature varies with the amount of rash, and may rise to 104°. The prodromal symptoms of rubella are always slight; many patients do not have them at all, while in measles they are always present; there are no Koplik spots during the prodromal period ; the superficial lymphatic glands are usually enlarged and tender. The rash is papular, begins about the lips and cheeks and covers the whole body in twenty-four hours; the papules remain more discrete; the rash fades more quickly; by the third day it may have entirely disappeared; there is no pigmentation, as seen after measles. The fever rarely rises beyond 101°. The glandular enlargement precedes the eruption in rubella, follows it in measles. Measles may have complications, rubella has not.

Practical Importance of Sore Throat in Epidemic Cerebrospinal Meningitis.—Westenhoeffer (*Berl. klin. Woch.*, 1907, xliv, 1213) states that sore throat always precedes epidemic cerebrospinal meningitis. Meningococci are always to be found in the pharyngeal secretion of meningitis patients, even very early in the disease, and are also found in healthy individuals and such as are having simple pharyngitis. It is usually the part above the soft palate which is affected. The larger the adenoids the more likely the children are of being hosts to meningococci. Not all cases of meningitis, following sore throat, however, are due to the meningococcus. The disease is probably spread by adults, in whose throats the meningococcus exists as a saprophyte, expectorating and thus scattering the organism about broadcast. The author reports a case in which, after a hemorrhoid operation, which was performed with stovain spinal anesthesia, the young man developed a meningococcic meningitis, of which he died on the fourth day. The organisms were found in the cerebrospinal fluid, but nowhere else in the body; no possible opportunity for the infection could be discovered, even after examining all the persons present at the time of the operation. He also reports the case of a baby, who died on the third day of such a meningitis, and in whom the kidneys were found to be full of the organism. This case suggests the possibility of excreta other than the sputum acting as carriers of the contagium.

Diseases and Displacement of the Testicle in Childhood.—D'Arcy Power (*Medical Press and Circular*, 1907, lxxxiv, 333) states that the diseases of the testicle in children group themselves under the headings of tubercle, syphilis, malignant growths, innocent tumors, and teratomas; displacements are due to faulty processes of development carrying with them additional predispositions to injury and disease. Tuberculous disease of the testicle is rare in children, but not as rare as the statistics indicate. It is sometimes primary, but more often secondary, and there is always a history of injury. It is a unilateral affection. The disease usually remains localized, the testicle being enlarged for some time, and then its size diminishes; atrophy is almost unknown. The treatment should be palliative, but a watchful eye should be kept on the body weight of the patient; if it falls, dissemination should be looked for, and the testicle removed at once if anything to support such a suspicion should exist. If suppuration results, removal is positively indicated.

Syphilis usually occurs before the age of three, is bilateral and almost always associated with hydrocele. Other signs of inherited syphilis are present. General enlargement of the testicle is more common than gummas, and suppuration is rare unless tuberculosis co-exists. Because of the painlessness and chronicity the process is usually overlooked, until late in the disease. Impotence and sterility are the necessary associates of this condition, if both testicles are affected.

Teratomas are either dermoids or sebaceous cysts; they should be removed without injury to the testicle if possible; if incorporated with the gland, this must be removed. Teratomas do not possess the translucency of hydroceles, and are more uniform in outline than epiploceles.

Sarcomas are rare in boys younger than ten; an injury frequently precedes. They grow very rapidly and because of their painlessness are usually very large before advice is sought. Immediate removal is the treatment, and even then most of the patients die. Imperfectly descended testicle, if associated with hernia, must be removed at once; if no hernia, it is better to wait until the patient is seven to eight years old, as sometimes the testicle descends further. Hydroceles should be punctured, and if they refill, a radical operation should be performed.

Symmetrical Gangrene Occurring in Patients with Malaria.—E. J. Wood (*Jour. Amer. Med. Assoc.*, 1907, xlix, 1891) reports 8 cases, in all of which there were symmetrical gangrenous lesions of the skin; 3 had malaria, as proved by the previous history, the quinine test, and the presence of the plasmodia; in the other 5 malaria was supposed to be present, since they all lived in a neighborhood where everyone has malaria, and no other provocative agent could be found. Six of the patients were children, and 2 of these died. Wood concludes that malaria may be considered a direct or a provocative agent of symmetrical gangrene of the skin. The skin lesions differed somewhat from the classical description of Raynaud. In one of his cases tertian and quartan malaria co-existed.

Sarcoma of the Eyelid in an Infant Seven Months Old.—H. S. Wieder (*New York Med. Jour.*, 1907, lxxxvi, 976) reports a case of sarcoma of the the eyelid in an infant seven months old; it was presumed to be a lipoma until after the pathological examination. Wieder says the tumor was probably a lipoma which had undergone sarcomatous degeneration. He calls attention to the rarity of sarcomas during the first year of life, he being able to find only about 20 cases recorded in literature. While the location of the eyelid is a relatively infrequent one for all ages, it is relatively frequent in cases under one year. Two weeks after removal of the tumor recurrence was noted; this was treated by Röntgen rays, and had entirely disappeared after five months of treatment. Nine months have elapsed since the original operation, and the child has remained entirely well and free of signs of tumor formation.

Facial Hemiatrophy.—T. Klingmann (*Jour. Amer. Med. Assoc.*, 1907, xlix, 1888) has been able to collect 83 typical cases of facial hemiatrophy, and divides them into two classes: cases in which the atrophy is complete, without functional disturbance of the facial muscles, with little or no disturbance of cutaneous sensation, and no vasomotor symptoms; and cases which present, in addition to the clinical picture of the first division, vasomotor symptoms, flushing or paleness, temperature differences, and secretory disturbances. Of his cases, 57 belonged to the first, 26 to the second division; 66 per cent. of the patients were females, and 66 of the 83 patients were less than twenty years old. A number of the cases were preceded by infectious fevers, such as scarlet fever, typhoid fever, erysipelas, suppurative tonsillitis, suppurative otitis media, and other abscesses in the neighborhood of the ear. In the case reported by Klingmann there is a direct heredity of physical deviations occurring in successive generations, the grandmother, mother, and twin-sisters. One of the latter had a complete right-sided facial hemiatrophy, the other a noticeable asymmetry of face and ears. The patient, a girl of sixteen, had suffered from headache since her sixth year. The pain was severest over the right occiput, down the neck to the seventh cervical vertebra, down the right shoulder and arms; the pain radiated to the parietal and frontal regions of the same side. The facial atrophy began with a brown discoloration in the supra-orbital region of the right side about the seventh year; beneath it a depression could be felt in the bone. The hair of this side began to fall out and the facial muscles to emaciate; this has continued progressively ever since. Careful comparative measurements were made and are recorded in the original paper. The right eye was less prominent than the left. There was tenderness on pressure over all of the spinal nerves, particularly over the great occipital nerve. The skin of the face was discolored, its elasticity diminished; perspiration over the affected side was less than over the unaffected. All the signs in this and the sister's cases point to a developmental defect, a defective nutritive process. Considering the symptoms of all the cases collected, it is evident that the symptoms are those of disturbed trophic function, that the disorder is more or less acute and more rapidly progressive at the beginning of the disease, and that the association with acute conditions is a close one; traumatism is not infrequent and infections are occasionally met. In these points and in the close analogy of the symptoms with those occurring in neuritis there is evidence of a peripheral nerve lesion.

OBSTETRICS

UNDER THE CHARGE OF

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The Relation of Streptococci to Thrombosis.—Von Bardeleben (*Archiv f. Gyn.*, 1907, lxxxiii, 1) contributes a paper giving the result of his investigations upon the influence that streptococci exert in producing thrombosis. Several factors contribute to the production of thrombosis by these organisms. First is the relation between the coccus and the leukocytes. The erythrocytes are sometimes involved in the process, but only in a passive way. They are influenced by streptococci; they are damaged by them without exerting influence in return upon the germs. With leukocytes the case is different; they show considerable resistance to the germs in proportion to the vitality of the individual cells. While they may be destroyed by the streptococci they are in return rapidly reproduced. Under certain conditions which are not pathological the relation between leukocytes and streptococci remains a fairly constant and normal one, and acute infection does not develop; the streptococci remain practically harmless. Were it not for the introduction of new germs or additional toxins from without, the leukocytes would speedily overcome the streptococci.

Another factor of importance is the resistance of the walls of the vessels to the passage of streptococci. When the vessels remain sound streptococci of feeble virulence cannot pass through them. The resisting power of this tissue seems to be greater than that of any other connective tissue. When, however, the walls of the veins cease to resist streptococci, the passage of the germs into the blood causes infection of the blood and thrombosis. Streptococcic thrombosis occurs only when the germs gain access to stagnant blood or when they make their exit through the walls of the vessels. While it is possible that streptococci may pass directly through the cavity of the uterus into the blood current, it is not probable. Only germs of the highest virulence can survive the resistance of the blood. Virulent streptococci find in the lymph channels and lymphatics a much more fruitful and convenient field, and general infection of the blood current through the uterine cavity must then be considered unusual.

Although streptococci may be in the cavity of the uterus the zone of resistance to infiltration may be built up by leukocytes from some other cause of irritation. The great channel, however, for the entrance of infection is partially collapsed or dilated veins. When such vessels remain open streptococci multiply along the walls of the vessels; and when they are closed by thrombi streptococci pass through these masses. If, however, the vessels are tightly closed a streptococcus finds the same resistance afforded by a resisting zone of leukocytes. It is then of the greatest importance, in preventing infection of the blood by streptococci, that the venous channels in the uterus should be completely closed.

To effect this the uterine muscle must contract efficiently, for when it does not the veins remain distended and the blood current passes through them much more slowly. The arrangement of the venous system of the uterus is such that the entrance of streptococci from the uterine cavity must almost invariably produce thrombosis.

The subsequent course of this condition will depend upon the virulence of the streptococcus or upon the ability of the germs present to increase in virulence through failure of the action of the leukocytes. If the streptococci are exceedingly virulent they will be hindered but a short time by the coagulation of the blood. Such coagulation tends to force bacteria through the walls of the vessels. When the bacteria are of feeble virulence they may produce no general symptoms. They gradually perish in the current of the blood. Where, however, the streptococci increase in virulence they form thrombi which grow against the blood stream. Poisons produced by germs give rise to general symptoms, œdema develops, and bacteria increase in virulence unless overcome by the resisting power of the leukocytes. Such a process usually terminates in the formation of pus if the resistance of the leukocytes is efficient. A typical illustration of this process is seen in phlegmasia alba dolens. The increased virulence of the streptococci is maintained by the accession of fresh poison, the thrombosis becomes purulent, and the affected individual perishes in about a week. Such is the course of a thrombotic pyemia.

Puerperal thrombosis with pyemia may be overcome by the closure of the central vessels, and in the typical uncomplicated form the streptococci are not of the highest virulence, grow within the vessels only, and have their exit through the vessels hindered by the resistance of the vessel wall. Further, the resisting zone of leukocytes tends to obstruct their progress.

Von Bardeleben does not think that the effort to control streptococcic thrombosis by ligation can be successful. When it is possible to diagnosticate this condition, a general infection has already occurred, the virulence of the streptococci is high, and the thrombosis is practically only a symptom of the general condition. When thrombosis has occurred the walls of the vessels are usually yielding to the passage of the streptococci.

It is in most cases almost impossible to distinguish clinically between cases in which the streptococci are undergoing resistance by leukocytes and those in which the walls of the vessels permit the passage of the germs.

Intraperitoneal Rupture of the Bladder during Labor.—PORTER (*Trans. Obstet. Soc. London,* 1907, p. 170) describes the case of a primipara, whom he saw in the first stage of labor. The pains were few in number, lasting but a short time, and in the back only. The position and presentation were normal, and there was no evidence of undue distention of the bladder. There was no indication of pelvic contraction, although it is not stated that the pelvis was measured. The first stage of labor was prolonged, efficient contractions developing very slowly. When labor finally began the pains continued during the night, increasing in severity. The following morning during a pain the patient suddenly complained that something had torn and began to suffer greatly from general abdominal pain.

When her physician arrived the knees and thighs were flexed upon the abdomen, the pulse 160, respirations rapid and shallow. The lips were dry, the tongue furred and dry in the centre. The abdomen was distended and tympanitic, especially at the epigastrium. The patient complained of general and continuous pains not resembling the pains of labor. The body of the child could be outlined and the uterus did not appear to be spasmodically contracted. The head was well engaged in the pelvis and the os uteri nearly dilated. The head could be pushed up, although this caused pain. The patient was at once delivered under chloroform with forceps. The cord pulsated very feebly and the child died soon after. The placenta and membranes were delivered about twenty minutes after, followed by severe postpartum hemorrhage. There was no severe laceration found after labor.

After delivery the patient's pains ceased and the abdomen was not sensitive to pressure. The pulse continued rapid and no urine was passed, but the patient was not catheterized. On the following day vomiting occurred without the passage of urine. The patient developed peritonitis with enormous distention and was removed to a hospital, where the abdomen was opened, and the sigmoid flexure, ascending and descending colon were found fully packed with hard feces. The stomach was enormously distended and gas was evacuated from it by a small trocar. The puncture was closed by sutures. Examination of the bladder showed a vertical rent about one-half inch in the upper and posterior portion. The bladder was closed and the abdominal cavity flushed with hot saline solution and a drainage tube was introduced, leading down to the bladder. The patient did not recover and an autopsy could not be obtained.

The Uterus Four Years After Cesarean Section.—BLAND-SUTTON (*Trans. Obstet. Soc. London*, 1907, p. 174) had the opportunity to examine a uterus four years after Cesarean section. The patient was operated upon at the London Hospital because she was pregnant and had a fibroid of the lower portion of the uterus which rendered the expulsion of the child impossible. She was delivered by Cesarean section. The tumor was not removed, as it was thought to be a fibrosarcoma springing from the pelvic wall.

Four years afterward the patient came under Sutton's care and he removed the tumor, which proved to be an ovarian fibroid. It was adherent to the uterus, which was spread out over the face of the tumor. The sutures used to close the uterus at the Cesarean section could be plainly seen on its anterior surface, resembling a series of transverse braids. The uterus was so adherent to the tumor that it could not be separated without hemorrhage and the body of the womb was removed with the tumor. A portion of the uterine wall was excised and examined microscopically, when it was found that the tissue surrounding the sutures seemed to be fibroid in character.

Sutton also reports another case in which he performed hysterectomy on a patient who had previously been delivered by Cesarean section. On examining the uterus it was found that the uterine wall had not united throughout its whole thickness. The suture material had been entirely absorbed.

In discussing the paper cases were reported in which silk sutures had remained quiescent in the uterus for nearly seven years. The patient then became infected with syphilis, when an abscess formed around one of the stitches, a sinus resulting, which closed when the stitch was removed. Another case was reported in which silkworm-gut suture had been employed to close the uterus and this remained unchanged.

GYNECOLOGY.

UNDER THE CHARGE OF

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Investigations Concerning Endometritis.—F. Hitschmann and L. Adler (*Zeit. f. Geb. u. Gyn.*, 1907, lx, 63) have made an extensive study of endometritis and make the following summary of their study: Endometritis glandularis hypertrophica and endometritis glandularis hyperplastica have nothing whatsoever to do with inflammation. Endometritis glandularis hypertrophica is not even a pathological condition of the uterine mucosa, but corresponds to the premenstrual state of the normal lining of the uterus. Endometritis glandularis hyperplastica consists partly of normal premenstrual conditions, partly of variations in the number of glands within physiological limits; in addition, it includes cases in which there is a glandular hypertrophy of the uterine mucous membrane, but this also is a change which is entirely independent of inflammation. There is but one variety of inflammation of the uterine mucosa, endometritis interstitialis, or, as it is usually called, endometritis. The inflammatory process is found, just as in inflammations of other organs, in the stroma of the mucous membrane. This robs endometritis of its artificially produced differences and places it with other inflammations on the general pathological basis. The diagnosis of endometritis is made by demonstrating the cells of infiltration; these cells, spoken of as plasma cells, are characteristic both from a morphological and staining standpoint.

The Mechanism of Axial Rotation of the Pedicle in Tumors of the Ovary.—R. Jolly (*Zeit. f. Geb. u. Gyn.*, 1907, lx, 87) reports from Olshausen's clinic the case of a woman of sixty-three who was to have been operated on for tumor of the ovary, but who died from cardiac weakness before the operation was started. The autopsy revealed a large avarian tumor twisted on its axis. Further study and reflection concerning the production of torsion of the pedicle led Jolly to the following series of statements: Every growing ovarian tumor has the tendency to fall toward the middle of the pelvis, as there it finds the least resistance. A tumor growing toward the median line does not have to change its position in the pelvis to approach the centre. A tumor increasing in size sideward very soon cannot grow any more in that direction, as it comes in contact with the pelvic wall. It is then pushed toward a point of less resistance with a strength corresponding to its increase in volume. As the tumor is held fast at one pole, its change in position is only possible by twisting around this pole. As the axis is usually in the direction of the long diameter of the pelvis the twisting is usually around its vertical and not its transverse axis. The direction of the tumor's migration depends upon the position of the axis and the free pole of the tumor; if the tumor develops behind the uterus the axis lies anteriorly and the tumor turns backward on itself: it twists in the direction of supination (Kuestner); if the pedicle is at the back of the growing tumor the rotation will be forward, in pronation. The tumor continues to grow in the direction once entered upon; a half-turn brings the posterior surface anteriorly, and vice versa; the same is true of the pedicle. The force producing the twisting of the pedicle is found in the growth of the tumor; the direction of the torsion, in the type of development.

Prolapse of the Ovary and Its Treatment.—G. G. Ward (*Jour. Amer. Med. Assoc.*, 1907, xlix, 1507) discusses the clinical significance and the treatment of prolapse of the ovary. The treatment depends upon whether the prolapse is or is not accompanied by retrodisplacement of the uterus. Ward recognizes two degrees of prolapse: In the first the ovary rests upon the fovea retro-ovarica of Waldeyer (termed the retro-ovarian shelf by Polk), and in the second it rests entirely upon the bottom of Douglas' cul-de-sac. Goldspohn has said that in 95 per cent. of cases of prolapsed ovaries there is a retroverted uterus, and Hanks, that in 33 per cent. of all uterine displacements prolapse of the ovary is present. Probably owing to the differences in venous circulation of the two sides and the passage of feces down the sigmoid, the left ovary is the more frequently prolapsed; or, if both are prolapsed, the degree is greater on the left side. Ward believes that nothing less than surgical treatment avails. If uterine displacement be present and corrected, and the ovaries are in that manner returned to their normal positions, nothing more is needed. But he believes that in a considerable proportion of instances the infundibulopelvic and ovarian ligaments are relaxed and should be shortened. In the class of cases that have prolapse of the ovary independent of uterine displacement, or after such displacement has been relieved, he believes additional surgical treatment is advisable. For this he prefers Imlach's operation of oöphorrhaphy as modified by Hirst, Sanger, Mauclaire, or Barrows. Of the modifications mentioned, Ward is partial to Barrows', which consists of shortening the round and infundibulopelvic ligaments and drawing the ovary through a buttonhole made in the broad ligament above the round one. The ovary is then lightly fixed on the anterior side of the broad ligament. If Gilliam's operation of round ligament shortening is done, the buttonhole is made, as in Mauclaire's modification, below the round ligament. Ward supports his position by the report of 11 cases of operation for this condition.

Eversion of the Tube in Tubal Abortion.—E. Falk (*Zentrbl. f. Gynäk.*, 1907, xxxi, 1404) says a high degree of eversion of the fimbriated end of the Fallopian tube was observed in a case of ectopic pregnancy. The clinical symptoms pointed to tubal rupture rather than tubal abortion. The mucous membrane was found everted on the different sides from 1.7 to 3.7 cm. This observation is believed to support the view of Werth that the expulsion of the embryo in tubal abortion is due to the contraction of the musculature of the tube and not primarily to the pressure of the mass of blood back of the embryo, as believed by Martin.

Chondrosarcoma of the Cervix Uteri.—Michel and Hoche (*Ann. de gyn. et d'obst.*, October, 1907, 607) report a case in a woman of thirty-five years, who had had three children, and who, after eighteen months of metrorrhagia and menorrhagia, consulted a physician, who removed what he considered was a polyp. Three months later severe hemorrhages, sudden and severe, occurred, and another examination revealed a mass of considerable size springing from the cervix. The mass was removed and the actual cautery applied. Two months later the symptoms led to another examination, and a friable, soft, bloody mass was found filling the vagina and attached to the cervix. It resembled a bunch of grapes. Some of the mass was hard and some soft. Hysterectomy was done. The growth appeared to have originated in margins of cicatrices of the cervix. From careful microscopic examination of the specimen and the case history, Michel and Hoche concluded that the disease had begun as a chronic inflammation of the cervical mucosa, which had given rise to a scirrhous inflammation and the production of a polypoid hyperplasia of the cervical mucosa. The new growth had developed along the borders of the cicatrix and had invaded all the coats of the uterus. Michel and Hoche claim that the grape-like form of the growth is characteristic of this form of sarcoma.

Hyperplastic Changes in the Mucous Membrane of the Uterus.—A. Hartje (*Zentrbl. f. Gynäk.*, 1907, xxxi, 1465) objects to the use of the terms glandular and interstitial hyperplasia of the endometrium. The changes often described under these terms as pathological are considered by the author merely as normal premenstrual changes in the uterine glands and stroma cells. Hartje describes the changes in the glands before, during, and after menstruation, and calls particular attention to a form of gland which is considered as of some pathological significance.

Ovary and Tube and Ovarian Tumors in the Inguinal Canal.—J. H. Carstens (*Jour. Amer. Med. Assoc.*, 1907, xlix, 1512) refers to the paper of Andrews, based upon 88 cases of prolapse of the ovary or tube, or both, into the inguinal canal, and adds to that number 27 other cases that he had found in a very careful literary research, together with one that has occurred in his own work. He also reports a case of ovarian cyst weighing six pounds and lying in and outside the inguinal canal. This unique case is thought to be the first, as no similar case is to be found in medical literature.

OTOLOGY.

UNDER THE CHARGE OF

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The Treatment of Otitis Media by the Method of Induced Hyperemia of Bier.—F. Isemer (*Arch. f. Ohrenheilk.*, 1907, lxix), under the incentive of Schwartze, subjected 12 cases of suppurative disease of the middle ear to treatment according to the method of Bier, and reported both his results and his conclusions. Of the 12 cases 9 were complicated with more or less extensive implication of the mastoid, 11 of the cases being acute and 1 chronic. The method of treatment was that followed in the clinic of Bonner according to the original technique of Bier, the means employed for compression being gum-elastic bands varying in width from 2 to 3 cm., the narrower being used in the cases of children; the degree of compression was regarded as sufficient when the face was of a bluish-red color, the compression being continued under these conditions from twenty to twenty-two hours daily. The summary of results is in accordance with the statements made by Schwartze: (1) The treatment of otitis media by this method is not without danger because of the possible delay in the application of otherwise indicated surgical measures for relief. (2) This method should be further tested clinically, in order to determine the forms of inflammatory processes in which an attempt at treatment by this method is applicable, and to determine also its duration before operative treatment is entered upon. (3) Protracted treatment by this method is especially hazardous in instances of diplococcic otitis. (4) The method is absolutely contra-indicated in the event of intracranial complication of the otitis.

The So-called Cyclic Course of Acute Otitis Media.—O. Koener (*Zeit. f. Ohrenheilk.*, 1907, lxvi) cites 3 cases under his own observation on the basis of which he suggests control observations with reference to the statement of Zaufal that the course of true otitis media is typical and corresponds to the cyclic development of the pathogenic agent. When the parasite has reached the full point of its development, that is, when the medium is exhausted, there is a resolution of the inflammatory process, similar to that occurring in pneumonia, and characterized by a sudden critical diminution of temperature, this natural course being allowed to come to its conclusion without the intervention of paracentesis. Koener has never observed, in uncomplicated otitis media, the high temperature lasting several days and with the sudden diminution not infrequent in pneumonia, an observation in which he is supported by Heine, but also regards it probable that the peculiar pneumonic temperature curve, if observed in an otitis, is due not to the otitis, but to some such complication as the co-existent exostosis of a pneumonic focus; the observations of Preising also having shown that pneumonia is a frequent complication in the otitis of childhood and an almost invariable complication in the otitis of nurselings, a statement based upon searching examination, since these pneumonias are easily overlooked on account of the small area involved and the absence of cough, expectoration, pain, and dyspnœa. With the assumption, based upon careful investigation that a high fever lasting several days and ending in rapid fall, in a case of otitis depends upon a simultaneous pneumonia, the theory of the cyclic course of acute otitis media is robbed of its foundation.

Professionally Induced Impairment of Hearing.—HABERMANN (*Arch. f. Ohrenheilk.*, 1907, lxix) reports 107 cases of impairment of hearing, putatively the result of exposure to continued loud noises—smiths, boiler-makers, metal-workers, millers, locomotive engineers, conductors, coopers, artillery men, and others whose loss of hearing resulted from disease of the perceptive portion of the organ of hearing. The pathological examinations included 10 specimens from 5 individuals; the changes in the internal ear, observable in all of them, was an atrophy of the organ of Corti confined in the majority of cases to the basal and vestibular portion of the cochlea extending, in 4 cases, only to the upper whorls and then in so much less a degree as to permit the supposition of its being attributable to other causes. Corresponding to the changes in the organ of Corti the nerve fibers in the lamina spiralis were either atrophied or had entirely disappeared—a condition which was in contrast to the contents of the ganglion cells of the canalis spiralis. The conclusion to be drawn from these observations was, that the effect of long-continued exposure to loud sounds evidenced itself primarily in the implication of the organ of Corti, and secondarily in the progressive atrophy of the tributary nerves.

Spontaneous Operation Induced by Cholesteatoma.—SUNE-MEDAN (*Revista Barcelonesa de oido; garganta*, etc., December, 1906) adds one more to the number of recently recorded cases of a form of spontaneous removal of the outer epitympanic wall observable in any extended practice, but none the less valuable for record as an indication for earlier operative interference along the same lines. The case reported is that of a woman twenty-eight years of age, who for two months had suffered from pain in the ear, an oscillating sensation and dizziness, and, within a month, swelling over the mastoid process and slight discharge from the ear. Examination showed marked prolapse of the posterior superior canal wall leaving only the lower portion of the drum head visible; postaurally there was that fluctuating swelling the incision of which liberated a quantity of fetid pus, the knife plunging without resistance into a large cavity. On the day following the incision a large mass of cholesteatomatous material was evacuated, leaving a large opening from which the posterior bony wall of the external auditory canal was entirely wanting, its removal having been as completely effected as it might have been by radical operation, and there was slight facial paralysis. Four days later the cavity was completely dry; at the end of twelve days it was almost completely epidermatized, and at the end of a month and a half completely closed in. The special interest attaching to the case lies in the unusually speedy destruction of the posterior canal wall and the extension of the cholestatoma between the bone and periosteum, an exaggeration of the minor cases of cholesteatomatous destruction above mentioned. At the time of the report the patient was well, the perforation in the drum-head had closed, there was neither tinnitus, dizziness, nor facial paralysis, and the hearing was one-half of normal.

Disturbance of Equilibrium Resulting from Disease of the Semicircular Canals.—J. Borowikov (*Wojenno Medizinski Schurnal*, St. Petersburg, May, 1907). The patient, a man aged twenty-four years, was admitted to the clinic for nervous diseases of the Petersburger Military Medical Academy after exposure to severe cold. The hearing in both ears was much impaired, his sight was dim, and he balanced himself with difficulty; a thorough examination gave no evidence of other disease than that within the cranium, and the hearing was reported to have decreased so much within the preceding year as to make the use of a conversation tube necessary. Both drum-heads were opaque, thick, and wanting in light reflex, but movable under the Siegle speculum. The particular interest in the case centred itself about the peculiarity of the disturbance of equilibration, which was equally in evidence whether the patient walked or stood still, and he could neither run nor walk backward, and could turn to one side or the other only with the greatest difficulty. (1) Examination by means of the centrifuge determined that the direction of movement was determined more easily when the movement was rapid than when it was slow. (2) The sensation of movement in the opposite direction occurred occasionally only when the movement was rapid and suddenly stopped. (3) There was no sensation of dizziness either in the centrifuge or without it. (4) Nystagmus was wanting. From all of which it was evident that the function of the labyrinth, and especially as concerned the semicircular canals, was very much decreased. Furthermore, no dizziness was excited by closing or opening an induction current of from five to six milliamperes.

PATHOLOGY AND BACTERIOLOGY.

UNDER THE CHARGE OF
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The Pathological Anatomy, Etiology, and Epidemiology of Miliary Fever.—Epidemics of miliary fever have been reported by several observers, and A. Weichselbaum (*Zeit. f. klin. Med.*, 1907, lxii, 21) has had an opportunity of investigating three epidemics. In one epidemic, which lasted from February until May, 57 persons were attacked, 24.5 per cent. of whom died; in the second epidemic 34 persons were attacked, with a mortality of 32.3 per cent.; and in the third epidemic, lasting from March until July, 1905, 126 persons were affected, the mortality being 16 per cent. These epidemics showed that the locality and the season of the year were of little importance. The peculiarity of the epidemics, the characteristic clinical course of the disease, and the pathological anatomical findings all stamp the condition as a disease "sui generis." So long as there is no epidemic the disease may be mistaken for other conditions, and at times epidemics may be confounded with scarlet fever, measles, and rötheln. The sudaminæ, whether they occur as nodules or vesicles containing clear or milky fluid, are never caused by a retention of fluid in the sweat glands, but are always of an inflammatory nature. This could be shown by serial sections through sudaminæ. The lesions are found in the epidermis principally, though changes are also present in the corium. The disease does not seem to be contagious. Although many methods of investigation were resorted to, the cause of the disease could not be discovered.

The Effects of Resection of the Hypophysis.—Paulesco (*Jour. de physiol. et de path. gén.*, 1907, ix, 441) has been able to devise a method by which he could remove portions of the hypophysis or the entire hypophysis in dogs and cats without serious injury to the surrounding structures. Complete removal of the hypophysis of dogs is followed very rapidly by death. The animals never survive the operation more than twenty-four hours. If the animal lives longer than twenty-four hours after the operation for complete removal, one may always find a small bit of the hypophysis which has been left behind. There are no special symptoms which are characteristic either after complete or incomplete removal. Excision of a portion of the cortical substance of the epithelial lobe does not give rise to any particular symptoms, and the dogs which have undergone this operation may live indefinitely. If, however, the entire cortical substance of the epithelial lobe is removed, the effect is the same as if the entire gland had been excised. On the other hand, ablation of the entire lobe which is composed of nerve elements, is not followed by symptoms and is compatible with life. During the experiments it was found that the third ventricle could be opened without fatal results. Death following excision of the hypophysis was not caused by injuries to the base of the brain, for such injuries were always followed by convulsions, hemispasms, and similar severe nervous disturbances. Paulesco concludes that the hypophysis is an organ which is indispensable to life. Its absence causes rapid death. Of the various parts of the gland the most important is the cortical portion of the epithelial lobe.

Trypanosome Infection through the Mucous Membrane of the Gastro-intestinal Tract.—Although it has been demonstrated, almost without a doubt, that tryponosomes are conveyed from infected animals to their new host by the means of insects, still a number of observations which have been published suggest that there may be still other methods of transmission. Yakimoff and Schiller noticed, two years ago, that a gray rat which had fed upon the body of a white rate infected with trypanosome developed trypanosomiasis. They therefore studied this method for the transmission of the disease (*Cent. f. Bact. und Parasit.*, 1907, xliii, 694) and have found that it is possible, in a certain number of instances, to produce the disease by feeding rabbits, dogs, guinea-pigs, and rats with meat infected with trypanosomes. Mice could not be infected by this means. The possibility of infection through mechanical abrasion of the mucous membrane was excluded. With the first experiments artificial means were resorted to for the purpose of furthering the infection. The animals were starved, opium was given, and an attempt was made to neutralize the gastric juice with sodium bicarbonate. With the exception of opium, which slowed the peristalsis, these measures were not found to increase perceptibly the tendency to infection through the gastro-intestinal tract. This path of infection does not, of course, have much importance in the transmission of the disease to herbivorous animals or to man, but it may play a certain role in the transmission of the disease to the carnivora.

The Action of Tobacco Smoke upon the Bloodvessels of Rabbits.—It has long been suspected by clinicians that tobacco had some effect upon the heart's action, while certain observers have even attributed some importance to tobacco in the etiology of arteriosclerosis. To throw some light upon this question from the experimental side ZEBROWSKI (*Cent. f. Allg. Path. und Path. Anat.*, 1907, xviii, 337) has inoculated rabbits with nicotine and the soluble products of tobacco smoke. Rabbits were inoculated intravenously repeatedly and at short intervals with an extract of "Machorka" smoke (Machorka is a low grade of tobacco which is smoked generally by the peasants in Russia)—an extract of a better grade of tobacco, a 0.5 per cent. solution of nicotine, and for control purposes adrenalin solution. At the time that the author wrote his paper 11 of the 40 inoculated rabbits had died; 4 rabbits which had received the "Machorka" smoke extract all showed more or less marked changes in the aorta. The changes consisted in dilatation of the vessel with irregular nodular thickening of the intima. 3 of the 5 rabbits which had received nicotine showed the same type of lesions in the aorta, while 1 of 2 adrenalin rabbits showed changes in the aorta. The aortas of 6 control rabbits kept under the same conditions were, of course, normal. Though this is but a preliminary report Zebrowski considers that he has sufficient proof to show that the soluble substances of tobacco smoke are capable, when injected into rabbits, of giving rise to definite changes in the walls of the bloodvessels.

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ORIGINAL ARTICLES.

GRAVES' DISEASE AND ITS TREATMENT.

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There is no disease which shows so many signs of a universally acting toxemia as Graves' disease. Not a physiological function of the body escapes being characteristically disordered by it at some time or other during its chronic course. It is pertinent, therefore, at the outset of its consideration to ask what disease, toxic or otherwise, that can be named, approaches it in this respect? Thus the functional nervous symptoms include great nervousness; mental disturbances ranging from depression, aboulia, and changes of disposition to actual mania; distressing tinnitus which may end in complete deafness, to disappear, however, with recovery from the disease; all varieties of functional disorder of the eyes; affections of smell and of taste; pains general or peculiarly located, or limited to certain groups of muscles; headaches; vertigo; various parasthesiæ; local motor paralyses; bulimia; insomnia; and pruritus. The vascular symptoms include palpitation, enlargement and throbbing of the arteries, both general and local vasomotor paralyses, and the characteristic tachycardia. The muscular symptoms are tremors, either general or particularly local, general muscular debility, local weakness of the knees, weakness or spasm of the laryngeal muscles, cramp of the calves, abasia, etc. Disorders of nutrition appear in extreme emaciation with marked loss of bulk in muscles and in bones, loss of hair, and pigmentation. The glandular derangements show themselves by thyroid enlargement with exophthalmos, by severe and characteristic disorder of the gastric and intestinal secretions, and by sweating, not to mention irritability of the urinary bladder, with or without polyuria.

Every one of these derangements can be extreme in degree in individual cases, but however grave or even fatal some of them may be, yet they have one important feature in common, namely, that no organic change accompanies any one of them. In any other disease such severe symptoms would be sure to be due to, or sooner or later be accompanied by, either inflammatory or degenerative textural alterations; but not so in Graves' disease. The tachycardia, although marked and prolonged for years, is not caused by nor associated with carditis in any form, nor does the heart show any kind of degeneration different from the nutrition changes in other muscular tissues. In Graves' disease death often follows upon uncontrollable vomiting and diarrhœa, but autopsies of these cases reveal not a sign of gastritis or enteritis. No visible changes from the normal are found in the eyes nor in the ears, however seriously disordered functionally they may have been. Likewise the great irritability of the bladder has no cystitis to explain it, nor is the itching accompanied by any cutaneous eruption.

This proves that one and the same agent produces all the effects. Graves' disease, therefore, is one, and being so it cannot be confounded with anything else—an important fact to bear in mind when we find it with the name goitre attached to it; because most goitres have nothing to do with Graves' disease and produce none of its symptoms, nor, as we shall see, are other tissue changes in the thyroid, lately alleged to be distinctive of this complaint, really so, because they may be found on dissection without any preceding or accompanying signs of Graves' disease. On the other hand, nothing can be more certain than the diagnosis of Graves' disease itself, since no other malady has so many characteristic signs. The absence of some of them, such as exophthalmos or an appreciable enlargement of the thyroid, is more than made up by the presence it may be of twenty other symptoms which are thus particularly grouped only in this malady. Therefore, the only deduction possible is that the complaint is due to a specific poison which goes wherever the blood goes and which causes no more tissue changes, except, indirectly, on nutrition, than does opium or aconite.

What the nature and origin of this poison is remains wholly unknown. More than half a century ago, Dalton in the preface to his *Physiology* congratulated the profession on the prospect that Claude Bernard's recent discovery of the sugar-making function of the liver would soon reveal the cause of diabetes. At present the explanation of diabetes is not yet in sight. So, in 1902, Kocher printed a bibliography of 1400 books, treatises, and articles on Graves' disease, and since that time the list may be extended to

2500. But all the experimental research and clinical observation, to which this voluminous literature testifies, have served only to illustrate the manifold uncertainties connected with the subject itself, and where uncertainity abounds theories proliferate.

The chief cause of this uncertainity is that as correct physiology is an essential prerequisite to correct pathology, we are yet at sea as regards the physiology of the thyroid and its associated structures. Unlike the adrenals, the active principle of whose internal secretion has been isolated and even may be artificially constructed, no one knows what the internal secretion of the thyroid is. Undoubtedly one of its physiological uses is to prevent the myxœdema which supervenes upon atrophy or upon ablation of the gland, and which otherwise fatal disorder can be relieved by administration of thyroid extracts. But the inference of an indispensable function of the thyroid on this account is considerably modified by the fact that while this gland, like the thymus, is a temporary organ and goes out of commission after fifty years of age, myxœdema does not then follow either upon its atrophy or upon its surgical removal. Hale White,[1] Kocher,[2] and others have shown that as age advances the thyroid degenerates, and in old subjects the normal glandular structure can with difficulty be recognized. In dogs, if they are old, thyroidectomy is neither fatal nor accompanied by the usual symptoms. Kocher points out that postoperative myxœdema scarcely occurs at all in elderly people.

Bourneville and Bricon[3] put the limit to postoperative myxœdema as early as the thirtieth year. The thyroid, therefore, is needed for an ill-understood purpose connected with the age of the body, apparently corresponding with the duration of the reproductive functions, and which may have to do with the susceptibility of women, to Graves' disease, the ratio in my experience being 9 to 1 in men. But if Graves' disease is primarily a thyroid disease, especially if it be due, as supposed by many, to hypersecretion of the thyroid gland, how can we explain severe and even fatal cases of Graves' disease in elderly patients who seem to have no thyroid left? I treated a lady who, in the course of three years, had become dangerously reduced with exophthalmic goitre. After a year's treatment she apparently wholly recovered, having increased in weight from 81 pounds to 142 pounds, with disappearance of both the goitre and the exophthalmos, but three years subsequently she relapsed and died in her sixty-third year with all the symptoms of her original complaint, except that the thyroid seemed to be wholly atrophied and could not be felt. Another lady recovered for five years from the severest symptoms of Graves' disease, and then relapsed and died when she was sixty-five years old without a sign of goitre.

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[1] Lancet, 1888, i, 521.

[2] Arch. f. klin. Chir., 1883, xxix.

[3] Arch. de neurol., 1886.

On the other hand, much the commonest and most pronounced goitres have no connection or relationship with Graves' disease. This gland is very sensitive to certain as yet unidentified stimuli in drinking water which excite it to great overaction with consequent hypertrophy. Lombroso mentions a well in Lombardy whose water produces goitre in fifteen days, and is resorted to on that account by young men who thereby aim to escape military service. But how this gland may have its cells stimulated into such activity without developing from beginning to end a single one of the twenty-six peculiar symptoms of Graves' disease, is a question to which none of the advocates of undue "thyroidism" give a satisfactory answer. Moreover, all authorities concur in stating that Graves' disease is no more prevalent in localities where parenchymatous goitre is endemic than it is elsewhere.

In recent years the problem has been further much complicated by the inclusion of the parathyroids in its consideration. By some (Gley,[4] Vessale and Generale,[5] MacCallum[6] and others) the function of the parathyroids is regarded quite as essential to life as that of the thyroid itself, and hence all former discussions on Graves' disease in which the thyroid only was considered are deemed seriously defective. In rabbits the parathyroids are not embedded in the thyroids, and Gley's explanation why thyroidectomy seemed to cause so little effect in those animals was that the removal of that gland did not remove the parathyroids with it, but when he excised the parathyroids the full fatal train of nervous symptoms developed, though the thyroid was left intact. MacCallum's parathyroidectomies in dogs supported the same inference of the tetany, etc., being the result of the absence of the secretion of these glands. But other experimenters contradict their statements. Vincent and Jolly[7] in their recent reports deny that removal of the parathyroids has any effect in rats, guinea-pigs, and badgers, and state that monkeys showed only transient nervous symptoms after the operation, while nervous symptoms sometimes developed although these glands were left in situ.

But meantime if the parathyroids are all which is claimed for them the question still remains unsettled as to how much of the symptom-complex of Graves' disease can be attributed to hypo- or to hyper-secretion of these little bodies or to total absence of their secretion owing to their entire disappearance, as this has been reported in examinations both of the thyroids of fatal cases and in thyroids removed by surgical operations.

Another of the many anomalies of this complaint is the supervention after surgical operations on the thyroid of two very serious conditions which are quite distinct in their nature from each other, although often confounded together. The first, which is almost uniformly fatal, is the development in the course of some hours after operation of rapidly increasing hyperpyexia rising from 103° F.. to 108° F. or 110° F., with great dyspnœa, extreme tachycardia, pulmonary œdema, coma, and death. Formerly this was called "acute thyroidism" and ascribed to sudden absorption of thyroid secretion from vessels and surfaces cut in the operation, or to undue handling of the gland, dislodging quantities of the secretion into the circulation. But it would be difficult to bring together so many pure assumptions as this view does or where theory and facts are so wide apart. That the thyroid should contain a powerful thermic poison at any time is rendered improbable by the clinical fact that the most fatal effects of the toxemia of Graves' disease continue to the last in keeping with all its other manifestations, in that no fever accompanies them. Graves' disease is preëminently a non-febrile complaint. In the second place this same fatal condition takes place after operations for Graves' disease in which the thyroid has not been cut into at all, and when every precaution was taken not to disturb it. R. F. Curtis,[8] alarmed by three deaths from "acute thyroidism" out of 11 thyroidectomies performed by him, tried instead the operation of sympathectomy in 7 patients, and although in operating he carefully avioded either wounding or handling the thyroid, 2 out of the 7 died from this imaginary thyroidism.

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[4] Compt.-rend. Soc. de biol., 1891.

[5] Arch. Ach. ital de Biol., 1895.

[6] Trans. Assoc. Amer. Phys., xviii, 35.

[7] Jour. Physiology, 1905, xxxi; 1906, xxiv.

A more probable explanation of this condition, so indicative of profound bulbar disturbances from the heat centre to the cardiorespiratory centres, is furnished by the intimate relations of the cervical sympathetic and of the thyroid itself to the medulla, section of the restiform bodies producing permanent exophthalmos. In fact it is dangerous to disturb the bulbar centres with any afferent excitation wholly new to them. Over 40 deaths with all the hyperpyexia and other symptoms of alleged acute thyroidism have been published as following upon washing out the pleura, and several from washing out the stomach, one of which, in the Addenbrook Hospital, London, was exactly parallel in onset and course with those following thyroidectomy.

The other condition has been called postoperative tetany, and although occasionally fatal, in some cases becomes chronic with symptoms characteristic of the disorder long known under the name tetany. This affection is itself obscure enough on account of its developing in the course of so many widely different diseases. It occurs in a variety of infections including malaria, but especially in gastro-intestinal disturbances, in teething infants, in nursing women, in Bright's disease, etc. But when the fact is added that its prevalence may be both endemic or epidemic, discussion of its etiology ceases to be practicable. Nevertheless the symptoms attending its development after operations on the neck are so similar to those following experimental parathyroidectomy that a good case may be made out for ascribing it then to trauma of those glandules or to interference with their blood supply. Halsted's[9] postoperative case, which in time was greatly improved by the administration of the parathyroids of beeves, strongly supports this view. Meanwhile, R. L. Thompson[10] in his exhaustive paper on *Atrophy of the Parathyroid Glandules in Primary Infantile Atrophy,* remarks that he never met with tetany in such infants and that the histological investigation of these glandules is in general negative in cases which had tetany in life, the records as usual being very contradictory, so that the fact is by no means proved that in the human subject destruction of these bodies always produces tetany.

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[8] Trans. Amer. Surg. Assoc., 1903.

The very latest pronouncement on this subject is by Dr. David Forsyth,[11] who by grants from the Royal Society and from the Science Committee of the British Medical Association, was enabled to make the most extensive experimental researches on parathyroids in all kinds of mammalia, as well as in birds. He expresses as his final conclusions the opinion that the parathyroids are glands not necessary to life and are essentially thyroidal in nature and possess no peculiar function.

Recently much interest has been awakened by the reports of Beebe and John Rogers of the successful treatment of Graves' disease by hypodermic injections of an antitoxin prepared from thyroids of cases of exophthalmic goitre. There can be no question of the apparently beneficial, if not the curative, effects of this new method of treatment in some cases, but its explanation is another matter. I can conceive that the specific poison of Graves' disease may be especially accumulated in the substance of the hypertrophied gland so that from it an antitoxin can be manufactured after the usual methods. This serum treatment, however, failed in two cases of my own although faithfully administered, by one of its discoverers for several weeks to the first patient, and similar failures have been reported by others. This, however, is only in keeping with other "cures" of Graves' disease, early enthusiasm subsiding with more experience.

But the most serious objection to the view that Graves' disease is primarily due to hypersecretion by the thyroid lies in the occurrence of numerous cases of Graves' disease, some of them fatal, in which there was no goitre or exophthalmos at any time in their history. It is begging the question to call such cases non-typical, *fruste,* or abortive when they show all the typical symptoms of the malady except goitre and exophthalmos, and equally so is it to term them latent or incomplete when the disease runs its course to a fatal issue in as large a proportion with them as in those with goitre. In my monograph on *Graves' Disease With or Without Goitre*[12] I give the detailed histories of 68 patients: 41 with goitre and 27 without, with a careful comparison of the percentage of each symptom in the two classes, sufficient to demonstrate that there could be no mistake in the diagnosis of the cases without goitre as nevertheless undoubted examples of Graves' disease. In this list there were 2 deaths among those with goitre, and 2 also in the lesser number without goitre. Not one of these 68 patients was a hospital case, because though I have had many such, yet their stay in hospitals is too short to make observations on them satisfactory, particularly as to the effects of any measures for treatment, medical or surgical. I have had 4 patients who seemed perfectly recovered from the disease, in 3 of them for periods of three, four, and five years, and then die from a relapse of the original complaint. The fourth who had not consulted me for nearly seven years because he said that at no time had he been ill, then relapsed and came very near dying, although he has since measurably recovered. Everyone of those patients had resumed a meat diet.

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[9] Amer. Jour. Med. Sci., July and October, 1907.

[10] Ibid., October, 1907.

[11] Quarterly Jour. Medicine, January, 1908.

Since the publication of that monograph, I have had a number of other cases of both classes, in private and in consultation practice, and I now regard those without goitre as on the whole the more difficult to treat. One lady without any goitre, whose mother died from Graves' disease, has been continuously under my observation for eighteen years with severe recurrences of Graves' disease whenever she takes meat. She had a sister who presented the same symptoms without goitre for five years and then developed a pronounced goitre just as she was getting well. She was very confortable with her goitre for six months, after which it wholly disappeared. Two years afterward she succumbed to cancer of the breast. Graves' disease goitre is very changeable in its size without any reference to the other symptoms, so that I pay but little attention to it.

Prof. Barker,[13] however, is seemingly so convinced that Graves' disease is necessarily a thyroid disease, that if we do not find a goitre there must be something of the kind nevertheless, and that faulty examination is responsible for the failure to find these virulently poisonous masses. He admits, however, that he has had three cases in his hospital wards in whom no such growth was palpable. But to me his views seem influenced by the observations of MacCallum and Halsted of a definite kind of alteration in thyroid tissue in Graves' disease, the anatomical details of which may be found in MacCallum's paper.[14] These changes may involve the whole gland or be limited to certain foci, when, of course, clinicians may be wholly ignorant of them and of their significance. I can only say that clinicians would welcome any anatomical proofs of Graves' disease and long have been waiting for them. But when Dr. MacCallum adds that these same textural appearances, general and local, may be found in the thyroids of sheep, goats, and particularly in stray dogs, and Dr. A. Kocher[15] says in human thyroids also, without any of the symptoms of Graves' disease accompanying them, these anatomical peculiarities may really have no more causative relationship to Graves' disease than the goitres produced by the waters of Lombroso's wells. Graves' disease without general indistinction from local symptoms does not exist, and as to foci I do not believe that a single focus remained in the atrophied thyroids of the two old ladies above mentioned, who died with all the symptoms of Graves' disease and of no other disease.

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[12] William Wood & Co., New York, 1904.

[13] Jour. Amer. Med. Assoc., October 12, 1907.

[14] Ibid., October 5, 1907.

I was early led to question the view that this malady is caused exclusively hy hypersecretion of thyroid juice, because like Pompey's Pillar at Alexandria this theory is so striking by its solitariness. If true it would tower over the whole field of medicine quite alone. We are all acquainted with hypersecretion by glands, but never without our being able to account for this behavior of theirs either by the presence in the blood of something which excites them, or less frequently by some nervous irritation. Salivation, however common, is never due to the parotids spontaneously flowing. As to a nervous irritation causing a serious morbid process persisting unchanged it may be for years, this, as Fagge well remarks, is a phenomenon wholly unknown in pathology. There is no limiting theorizing when the nervous system is brought in, as when Hector Mackenzie ascribes Graves' disease invariably to fright, so that although the patient cannot remember the fright some ancestor of hers may once have been badly scared and thus started the process. Hence I pay little credence either to the view that Graves' disease comes from the cervical sympathetic or that the thyroid secretes its poison just as it were, from its own innate depravity. If the thyroid does secrete uncommonly, something not of the thyroid must make it do so. This doubt, however, by no means excludes the supposition that when once Graves' disease is established by its own primary cause, conditions of the thyroid and of the sympathetic may materially affect its course.

My own views of the pathology, and, therefore, of the treatment of Graves' disease, are based upon therapeutics. Clinical observations are as good as laboratory experiments, provided that in making them the same care is taken against fallacies in observation and in deduction. This cannot be done without writing down the observations every time they are made, through years if necessary. Only private, in distinction from hospital, patients, for reasons already stated, will afford the necessary data for conclusive demonstration.

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[15] Jour. Amer. Med. Assoc., October 12, 1907.

My final verdict is that proper medical treatment furnishes the best chances for recovery from the disease in *severe* cases, and, of course, therefore, in the milder forms. If I could have the complete control of the management of the patient I would prefer one who has been brought too low by the disease for the surgeon to venture to propose operation. The histories of several such are detailed in my book. Incipient or mild cases too often improve spontaneously to be at all conclusive. The one condition when I would have but little hope is when uncontrollable vomiting and diarrhœa have supervened in a patient already far gone. As the best cure for indigestion is digestion the only recourse then is to find some form of food which will stay down although only in very small doses. At no time in the course of Graves' disease can its diarrhœa be checked by opiates or by astringents.

As to pathology, my first surmise of it was suggested by the case of a lady who came to me with exophthalmic goitre twenty-seven years ago, much reduced in flesh and strength. In addition to medical prescriptions which I now regard as useless, although found then in the text-books, I enjoined her restriction to the Asiatic fermented milk preparations, which I was the first to introduce to this country, but which are quite generally used now under the names of kumyss, matzoon, zoolak, etc. She immediately began to improve in every respect, and after six months felt so well that she ceased her visits. In three months more I was called to see her again prostrated with her old symptoms. Again she was put on the milk and again she thought she had recovered. At the end of another summer I was hastily summoned to her bedside only to feel her pulse stop forever while I had my finger on it. I was told by her family that in spite of their protests she began to eat meat heartily, saying that she would rather die than take the milk. Similar injury to patients with this disease from indulgence in butcher meat has been duplicated in my experience ever since. I would as soon recommend confirmed diabetics to take all the starchy food they please, as to advise the Graves' people to relieve their weakness with that strengthening article, roast beef.

Here it begins to look like discerning the same relations of Graves' disease to the nitrogenous elements of food that diabetes has to the starchy elements, in other words we find our therapeutic guide (diet) leading us directly into the great forest of metabolism where all paths are soon lost in the thick undergrowths of theory. But what we do know is that in diabetes, if the system cannot get any carbohydrates it will split up its proteins into sugar with fatal results, and hence in Graves' disease our proper dieting must somehow provide nitrogen the best way it can, and for that we will give a diet list accordingly. But how about those glands in the neck? Some say that if the parathyroids are removed a virulent poison soon destroys the dogs unless they are freely bled and a compensatory amount of normal saline is infused, when they will live for twenty-four hours until this same poison has accumulated enough to necessitate a repetition of the infusion. Or the dogs may be kept longer alive if they are fed on bread and water. Give them meat and it quickly kills them. The plain deduction is that a poison coming from somewhere is normally neutralized by the parathyroids, and the effect of diet points to the alimentary canal as the source of the poison. The steps between the food taken and the parathyroids belong to the yet hidden secrets of metabolism, and so also do the other problems of Graves' disease, for the whole symptom-complex of this malady cannot be explained by the parathyroids. One other poison at least must be accounted for, whose property is to paralyze the vasoconstrictors everywhere, and by dilating all arterioles cause the tachycardia and many of the other symptoms of the disease. This poison, therefore, is the opposite of adrenalin in its effects.

But we are now again landed in the thickets of theories. One theory has long held the field, namely, that whereas the parathyroids neutralize a poison the larger gland produces one, or what is virtually so by its own proper secretion being improperly increased. Oswald, however, insists that instead of its own secretion being increased it is decreased. However, not to prolong an article already suggestive of why there are 2500 other writings on this subject, we will call in our therapeutics to supply a theory based on a solid fact to begin with, which is that by proper diet Graves' disease generally subsides as commonly as glycosuria after middle life disappears by its proper diet. In addition to this some of its most intractable symptoms promptly yield to medicines which affect the intestines. Repeatedly I have brought down the pulse forty beats by one blue pill, which certainly cannot slow the pulse in the same way that veratrum viride does, because neither veratrum nor any other cardiac sedative controls this tachycardia. Hence it may be that a poison generated in the alimentary canal normally finds in the thyroid what the other poison finds in the parathyroids, that is, a gland which can neutralize it. Excessive amounts of this poison in the blood excite the thyroid into overaction and thus often, not always, lead to its hypertrophy. The goitre, therefore, is secondary to a blood condition, just as hypertrophy of the spleen is, and to get rid of it and of all its other accompaniments we must attend to the intestine.

All theories, however, that I know of about Graves' disease have one failure in common, viz., that no one of them explains all the facts, and mine outlined above is no exception. How a toxemia originating in the alimentary canal can be cured by a surgical operation not on the alimentary canal but on the thyroid, is not very clear. That Graves' disease has been successfully relieved or cured by such operations is no longer to be questioned. My only answer is that it seems to me equally clear that the theory of Graves' disease being primarily and always a thyroid disease is a mistaken theory, and, hence, that the seeming contradiction is because the whole subject abounds with anomalies, as do all problems connected with metabolism, not the least of which is to explain on what surgical principle the present mode of operating in Graves' disease is based, as we will soon note.

We do not yet know much of the physiology of metabolism. Thus the relations of the internal secretions of the little islands of Langerhans to diabetes are no plainer than those of the little parathyroids to fatal tetany. We are yet to learn what enzymes are and what they do. Nor have we yet learned all about antitoxins ar antibodies. Sometimes a chemical process is supposable and at others equally inadmissible. My own provisional hypothesis in this case is that, due to a physiological affinity the thyroid may accumulate a store of enzyme-like toxin brought to it by the circulation which may then act as a nidus for discharging the agent from time to time when the gland is stimulated by fresh supplies of the toxin derived from improper diet. Surgically removing this nidus may then be as beneficial as removal of the spleen sometimes is when it has hypertrophied from noxious accumulations in its substance. But neither this nor any other hypothesis yet offered covers the whole ground. A complete thyroidectomy would be the only recourse if the usual explanation of the benefits of the operation was valid. Instead, at present, only partial resections are recommended. The part of thyroid left, no matter how diseased, then becomes normal as does the patient also. This surgical fact has no parallel elsewhere, certainly not in the infections or degenerations dealt with by surgeons. Neither a tuberculous gland nor a patch of gangrene can be left to get well, because it has been half cut out. A cure of such a serious toxemia as that of Graves' disease by removing a portion only of the thyroid gland is beyond all present explanation, and can be accepted merely as an empirical fact.

But it is also a fact that Graves' disease, whatever its stage or degree, can be equally benefited or cured by proper medical treatment alone. Failure then is due to difficulty in managing the patient and not the disease. Many women seem incapable of that perseverance in observing the regimen and continuing the medication for the prolonged time that is essential to control a malady which is like diabetes in its requirements for both abstinence and observance. One of the important objects is to enjoin rest from muscular exertion, to secure which the physician should explain to the patient that muscular debility is a specific accompaniment of the affection as much so as in fever, and no transient condition which will-power can overcome. But likewise all fatigue is to be avoided. It is striking how soon certain nervous symptoms, such as headache and insomnia, follow upon both undue muscular and mental exertion in these patients.

On the matter of diet the directions cannot be too positive and too detailed. Butcher meat is never to be allowed. Fish, if not too oily, as salmon or smelts, seems much less objectionable than meat. Oysters, clams, and lobsters are forbidden. Poultry can be taken sparingly, but not at night. Not more than one egg a day, best taken at breakfast, is allowable. Of game I only allow quail and partridge, but no dark meat birds.

The standard article, however, is milk, which alone will cure many severe cases of Graves' disease if it be taken as the Bedouins and Tartars of Asia take it as well nigh their only food. A Bedouin would no more drink fresh milk than we would eat a raw potato. He always ferments it first, with yeast as the ferment. Most Tartars use the plant keffir as their ferment. Peptonized milk will answer if the patient does not know how to make the fermented milk. Raw milk, on the other hand, is wholly indigestible in the quantities which should be taken in this disease, and if ever taken should be half diluted with Vichy or with lime-water.

Next to living on milk the patient should be a vegetarian, for vegetable albumen rarely disagrees. Bread, particularly if crusty, and rice can be taken ad libitum, but hot soda biscuits are nearly poisonous, and starchy crackers are to be avoided in persons much troubled with headaches. Of vegetables, beans (except string beans) and peas are wholly inadmissible. I would rule out also asparagus and, to a less degree, spinach. Of the cereals oatmeal is forbidden, but the others in common use, particularly hominy, are recommended as they are so often taken with milk and cream. Nearly all the fruits are beneficial except uncooked apples and strawberries. Of course in a disease so marked with digestive disturbances, individual idiosyncracies will have to be respected.

Medicinal treatment holds a high place in my estimation. To every patient I recommend 30 grains of the phosphate of sodium taken at the beginning of each meal. A blue pill or other mercurial laxative taken twice a week is a routine prescription. Then a course of intestinal antiseptics is kept up for months at a time. I usually begin with sodium salicylate and sodium benzoate, of each 10 grains, an hour after each meal. At bedtime I give a capsule containing naphthalene 3 grains and sodium benzoate 6 grains. After a time I substitute a capsule containing phenol bismuth and ammonium benzoate, each 5 grains, of which two should be taken an hour after meals. The principle of these remedies as intestinal antiseptics being understood, every physician can vary the prescriptions as he finds best.

No patient with confirmed Graves' disease should be promised a speedy cure. I once thought that two years' absence of all its symptoms might allow the hope that it would not return, but I do not now, because my experience makes me dread a case of relapse after a long interval of freedom more than I do any other instance of the disease. I have mentioned the patients who, once severely affected with Graves' disease, apparently remained entirely well for periods varying from three to seven years. They then relapsed and none of the remedial measures which before were so effective were of any avail; four out of the five dying on my hands. This result is not without its analogy in diabetes, for if a diabetic once indulges in starches his glycosuria then increases often for weeks after his indiscretion, though he may have quickly returned to his old observance of rules of abstinence; and as I have mentioned above each of my patients with a late relapse had returned to a meat diet.

ADIPOSIS TUBEROSA SIMPLEX.

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There is a condition which resembles Dercum's disease in respect to certain clinical features, but it differs markedly from adiposis dolorosa in its course, and, unlike the latter disease, is amenable to treatment. The subjects are obese and sometimes extremely so, as in one case which I observed. The disorder may occur in the plethoric or the anemic form of obesity, although more commonly perhaps in the latter.

Circumscribed fat masses appear in the subcutaneous tissues; they form distinct, moderately dense, slightly movable, somewhat flattened tumors, ranging in size from a bean to that of a hen's egg. Their number varies all the way from one-half dozen to two dozen or more. These moderately firm fat-nodules are not distributed over the entire body, but in some cases are confined to the extremities, particularly the lower, and in others, to the abdomen. The tumor masses show no tendency to fuse together and are not elevated above the surrounding surface; they are sensitive to the touch and may be the seat of pain which varies in intensity within rather wide extremes. being moderately severe and distressing in rare cases and trivial or even absent in the majority of instances. The lymphatic glands are not involved, and the skin remains soft, flexible, and non-adherent. The mental processes are normally active, and also the muscles; asthenia is not present, and there is no more indisposition to physical exertion than is observed in cases of obesity as a rule. The knee-jerks are present and the cutaneous sensibility is unaltered, in some cases at least. The mammæ and abdominal panniculus adiposis may be overhanging or pendulous, but not in all cases, as an analysis of the symptoms of the instances reported below will indicate. It is an uncommon condition, since it was noted in only 4 out of a total of 324 cases.

The etiology is that of general obesity, as far as I have been able to determine. No pathologico-anatomic study of the associated subcutaneous fat-nodules was undertaken, for the reason that they were removed in every instance as the result of treatment of the polysarcia adiposa. Their intimate association etiologically with corpulency is almost undoubted, in view of the fact that their disappearance is determined by proper treatment for the latter condition. For the identical reason, the condition known as tuberosa dolorosa may be excluded.

Brief notes of my cases may here be narrated:

Case I.—J. H. J., aged forty-three years, single, occupation physician, applied to me for treatment February 4, 1903. The weight was 385 pounds (nude), and the height 5 feet 10 inches. The family history reveals the presence of gout in several generations on the mother's side; the maternal grandfather weighed 250 pounds, and two brothers each weigh 225 pounds. His paternal grandfather died of chronic cardiac disease. Both parents are living, and in good health.

Previous History. Some childish diseases; at the age of ten years was kicked by a horse in the jaw, and as a consequence partook of fluids for a number of weeks. When a return to solid articles of diet was made, he began to take on flesh, and had been going from bad to worse in this regard until the date of his first visit. In recent years the dyspnœa on physical exertion was a most troublesome symptom.

Social History. The patient used spirits quite constantly, although not guilty of excessive indulgence; smoked regularly to a moderate extent since early adolescence; never took muscular exercise systematically. Patient observed that abstinence from alcoholic beverages lead to a slight diminution in bulk and weight, although it is to be recollected that hereditary predisposition is easily traceable. An excessive diet of starches and sweets was also an etiological factor.

Present Condition. Patient complains of breathlessness on exertion; has inclination to rest often and sleep much. Muscular power has of late been diminishing gradually and slight subjective symptoms, referable to the viscera, as the lungs, heart, and stomach, have been manifesting themselves, but distinct asthenia was not observed. An examination of the urine revealed the following result: The twenty-four hour quantity was 2000 c.c.; the specimen was clear, specific gravity 1024; uric acid and urates increased; a trace of albumin, and hyalin and granular casts were noted. There was neither indol, skatol, nor sugar present.

Physical Signs. The face was congested, chest broad and deep, waist thick and prominent, with pendulous abdominal parietes, while the arms and legs were also quite massive. The respirations were hampered and much labored on slight exertion, and the respiratory sounds, on auscultation, slightly wheezy and attended with a few sibilant rales. The heart's action was exceedingly distant and apparently feeble, and the pulse was small, rapid, irregular, and intermittent. There were no murmurs present and the size of the heart could not be outlined owing to the extreme subpericardial overfatness. No evidences of atheroma were presented, although the aortic sound was somewhat accentuated. From the median line of the abdomen and extending to the right flank, six rather hard masses, four of which were as large as flattened hen's eggs, could be readily palpated in the subcutaneous tissue. They were painful, at times excruciatingly so, and quite sensitive to the touch. There were no similar masses to be found elsewhere over the body.

Treatment. The patient was put upon a suitable treatment for the marked obesity, the chief reliance being placed upon the dietetic restrictions as indicated by the appended diet list:

Morning Meal or Breakfast: An orange, two peaches, or grapefruit, one soft-boiled egg, or an egg cooked in any manner except fried; or, instead of the latter, chicken minced or broiled, 2 ounces; two glasses of skimmed milk; graham bread, 1½ ounces.

Noon Meal or Luncheon: Caviare, 2 drams; raw oysters or boiled ham or sweetbread or fowl or game, 3 to 4 ounces; the meats at this meal are to be taken cold when convenient; salad, 1 ounce (without oil); cheese, 2 drams; bread, rye or bran, ½ ounce; fruit (except strawberries and bananas) 4 ounces; or, instead of the latter, may take 4 ounces of water.

Evening Meal or Dinner: Fish, 2 to 3 ounces; sweetbread or game or poultry or veal, 3 to 4 ounces; one of the following green vegetables—asparagus, spinach, string beans, green peas, cauliflower, celery, sorrel, lettuce, and macaroni with a small amount of cheese, 1½ ounces; graham bread, or toasted bread, ½ ounce. For dessert, may take 4 to 5 ounces of fruit; junket or custards (sweetened with saccharine). Instead of fruit, may take a glass of water.

No liquid at mealtime except as indicated above.

In addition, a glass of Celestines Vichy water four times a day, one hour before mealtime and on retiring, was allowed, for the purpose of combating the excess of uric acid in the blood. Massage with Swedish movements on Mondays, Tuesdays, Thursdays, and Fridays was insisted upon, as well as a tepid bath on rising, followed by active friction of the skin.

The only medicinal substances employed were cardiac stimulants and tonics.

As the result of this treatment there was a gradual loss of weight, and at the end of one year all of the subcutaneous tumors had completely disappeared. The patient, who lived in New England, called on April 30, 1904, when his weight was 300½ pounds. Not a vestige of the former tumor masses could be detected, and the patient reported that pari passu with the loss in weight both the circumscribed tumor masses and the pain had vanished.

Case II.—Mrs. E. J. B., aged forty-five years, applied for treatment February 2, 1902. Weight 180 pounds (nude); height, 5 feet 5 inches.

Family History: Father stout, and both rheumatism and gout are shown by paternal side of family; the paternal grandmother died of heart disease, while the patient's mother had uratic deposits.

Previous History. Patient had had certain childish diseases, and scarlet fever and measles since marriage. For many years had manifested gouty and rheumatic symptoms at irregular intervals; there had been two attacks of grippe and one of cellulitis affecting the pelvis many years previously. More recently has suffered from flushes and extreme despondency.

Social History. The patient is childless and passing through the menopause, having menstruated but three times in the previous year. There had also been a tendency to suppression of the menstruation from time to time in the preceding years; this was attributed to anemia, from which the patient seemed to suffer at intervals. The patient had paid some attention to systematic exercise and also to the matter of dieting, but not for any lengthy period of time. He had used tea and coffee, though not to excess; had taken wines and spirits with great moderation.

Present Illness. Dates the origin of the present condition back several years, or to the time when the gouty and rheumatic symptoms became aggravated, since which time she has shown a tendency to grow stouter. There has been a decided disposition to gouty pains and swelling and stiffness of the fingers and feet for years, and at present the shoulders are implicated. There has been some dyspnœa upon physical exertion, and undue liability to contract colds. The urine analysis proved negative, although this secretion was strongly acid. A blood examination gave the following result: red cells, 3,870,000; white cells, 10,000; and hemoglobin 70 per cent. The red cells stained normally, and polymorphonuclear leukocytes seemed to be relatively diminished.

Physical Signs. Obvious pallor of mucous membranes and skin, although body is plump and apparently well nourished. The left ventricle of the heart shows a slight degree of hypertrophy, but the myocardium lacks vigor; aortic sound is accentuated, but the palpable vessels are not sclerotic. I accidentally discovered a considerable number (about one dozen) of tumor-like masses in the muscles, more particularly of the thighs, although a few were also observed in the fleshy portion of the forearm. They ranged in size from a Lima bean to that of a somewhat flattened English walnut, and were not elevated above the surrounding surface. Their range of mobility was very slight. They lacked the softness of true fatty tumors and were not lobulated in character. The patient made no complaint of pain referable to these masses, and a few only were moderately painful on rather severe manipulation.

Treatment. The treatment was similar to that of Case I. A suitable dietary, a glass of Saratoga vichy three hours after each meal and on rising, massage (Mondays, Tuesdays, Thursdays, and Fridays), a walk of three miles daily, and a cool bath on rising, followed by active friction to the skin, constituted the principal elements in the management of the case, and produced a slow and gradual reduction of the weight, which fell from 180 pounds (nude) to 165 pounds. After the loss of about 10 pounds a noticeable reduction in the size of the larger tumor-like masses was observed, while the smaller ones had already disappeared. Later, or in the course of two months, there was an entire disappearance of these circumscribed tumors. In this case a discontinuance of the treatment was followed by a renewed increase of weight up to 179 pounds, and a return of the tumor-like masses described above, although they were neither so numerous nor so large. A recourse to the dietary and *regime* previously employed again led to satisfactory results, with a disappearance of the fatty tumors.

CASE III.—Mrs. A. H. F., aged thirty-seven years, nativity American, first consulted me April 9, 1903. The weight at that time was 190 pounds (in clothes), and the height 5 feet 6 inches.

Family History. Both parents living, mother inclined to obesity and is gouty, while the father has chronic Bright's disease. Otherwise no hereditary taint.

Previous History. Childish affections. From girlhood has been troubled with neuralgia and gouty pains at short intervals, but has not suffered so much since marriage. Had an attack of grippe one year ago, and has looked poorly since. There is a history of general nervousness, extending over a period of several years; the patient became despondent and irritable at intervals.

Social History. Married, has two healthy children; menstruation normal. Has dieted for the corpulency, but unsuccessfully; is not fond of exercise.

Present Illness. After the birth of the first child, about ten years ago, began to take on flesh slowly and gradually, with a corresponding increase in the severity of the gouty manifestations. There has of late been considerable dyspnœa on exertion. The urine analysis shows a qualitative increase in uric acid, otherwise it appears normal.

Physical Signs. Nothing abnormal is presented by the lungs and heart, although the first sound is distant. There is no evidence of any cardiovascular change. The fat deposits occur principally over the hips and abdomen. Patient discovered a number of small, non-painful fat masses scattered over both hypochondriac regions. They are painless, although slightly sensitive to the touch.

Treatment. The patient was placed upon a somewhat restricted dietary, particularly with reference to the carbohydrates, and, in addition, the following directions were given: a walk of three miles daily, preferably in the morning; a glass of Saratoga vichy three hours after each meal and on rising, and a warm bath on retiring, followed by active hand rubbing, beginning at the feet.

May 19, 1903. Patient reported upon her condition; weight, 182 pounds; feels herself greatly improved. The rather soft, elastic masses of fat have greatly diminished in size, and now do not exceed in size that of a pea. The same *regime,* including massage, was ordered to be continued, the patient using no medicines.

September 24, 1903. No fat tumors palpable at this time; weight, 168 pounds. Patient states that she feels somewhat nervous. The dietary was now relaxed and a tonic was ordered.

May 10, 1904. The patient still slightly nervous, although she has led an exceptionally active and strenuous life during the past winter; weight, 164 pounds (stripped). Is given to emotional disturbances at intervals. Not a trace of the former tumor-like masses detectable around the waist, and there has been no recurrence since the previous autumn. The patient was able to endure more than many of her apparently healthy friends. No extract of thyroid had been administered, but a tonic was now prescribed composed of strychnine sulphate, extract of sumbul, extract of gentian, and quinine valerinate.

CASE IV.—Mrs. F. W. W., aged thirty-two years, nativity American, first called on me September 10, 1901. Her weight was 158½ pounds, and the height 5 feet 5 inches. The family history reveals carcinoma on maternal side (mother and two aunts); father was a paralytic, due to apoplexy. There was no hereditary taint with reference to gout; the patient's mother weighed 175 pounds.

Previous History. The patient had had childish diseases; was treated for spinal curvature at fourteen years of age, and typhoid fever at twenty. During pregnancies was subject to fainting and nervous attacks.

Social History. Menstruation regular, but scanty, with cessations and recurrences; married and has three children one of whom died of summer complaint. Patient uses tea, but no coffee; has been dieted without success, but has never adopted systematic physical exercise.

Present Illness. This began more than two years previously with fits of indigestion, accompanied by eructations of large quantities of gas; during the same periods she was highly nervous and despondent.

The *physical examination* of the viscera proved negative. The patient was moderately corpulent; circumscribed, deeply seated tumor masses were noted, one large and numerous small ones, especially in the legs. The urine analysis showed nothing abnormal, except that this secretion was strongly acid. A blood examination was not made, although the patient did not present any obvious indications of anemia.

Treatment similar to that decribed under Case II was instituted, and after a loss of 5 or 6 pounds in weight about one-half of the small masses had disappeared, while a single large tumor showed considerable diminution in its dimensions. Unfortunately, treatment was discontinued at the end of two months, and hence the result was not satisfactory.

Case I, of this series, manifested symptoms which bear a close clinical resemblance to adiposis dolorosa, especially of the so-called nodular variety. For a considerable period of time while the patient was under my care I looked upon the case as belonging to this form of adiposa dolorosa, for the reason that localized nodular deposits of fat and pain were in evidence. On the other hand, the absence of any psychic disturbance and asthenia out of proportion to the marked polysarcia, and more particularly the complete disappearance of the fatty masses as the result of treatment directed to the extreme obesity, led me to exclude Dercum's disease.

In Case II, the fact that the circumscribed fatty tumor-like growths were, in the main, painless, and readily disappeared as the result of appropriate treatment, led me to believe that they were dependent upon the general obesity.

In Dercum's disease, a study of the postmortem lesions revealed,[1] as prominent features, "irregular atrophy of the thyroid gland, with here and there efforts at compensatory hypertrophy; also extensive interstitial neuritis in various nerves as they passed through the fatty tissue, and, in addition, degeneration in the columns of Goll. In the fourth case—that reported by Dr. Burr—there were present in the thyroid gland changes identical with those above described, interstitial inflammation of nerves, and, in addition, enlargement and gliomatous degeneration of the pituitary body."

The presence of hemolymph glands has also been noted in that disease; they are believed to exert a compensatory function. It must be granted that in Dercum's disease there are grave disturbances of the metabolic processes, and that lesions of the thyroid gland, as well as of the pituitary body, play a significant role in the causation of these disturbances of nutrition. In my own cases the course and results of treatment would seem to contradict the presence of any gross pathological changes in the lymphatic structures, and therefore stamp them as being essentially different in nature and tendencies from adiposis dolorosa—a comparatively benign condition as compared with the latter affection.

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[1] Autopsy in a Case of Adiposis Dolorosa, by F. X. Dercum, M.D., and D. J. McCarthy M.D., Amer. Jour. Med. Sci., December, 1902.

Again, it is scarcely conceivable that the mild, nervous and other associated features, as well as the tumor-like masses, which are observed in adiposis tuberosa simplex, and are so easily removed by dietetic and regiminal treatment, could have as an underlying causative condition grave lesions of either the thyroid gland or the hypophysis.

Lipomas, by their painlessness, soft, doughy, semi-fluctuating consistence, their more globular shape, as evidenced by the slight though distinct elevation above the surrounding surface and more or less lobulated character, may be excluded. Moreover, these tumor-like subcutaneous growths are not dependent on associated general obestiy, and are not amenable to medicinal, dietetic, and regiminal treatment.

Launois and Bensaude[2] have described multiple symmetric fat deposits unattended by any disturbance of the general health, except in some cases, in which asthenia or fatigue, with or without irritability, apathy, and even hypochondriasis, have been observed. Adenolipomatosis, however, may be readily differentiated from the cases for which I have suggested the title, adiposis tuberosa simplex. In the first place, adenolipomatosis generally coincides with such widely various conditions as syphilis, albuminuria, gout, carcinoma, asthma, and varicosities, and only rarely with obesity. These tumefactions are symmetric in their distribution, with constant localization in the vicinity of the neck, axillas, and groins, adenolipomatosis being in all probability a disease of the lymphatic system.

On the other hand, the cases which I have herein reported manifest a totally different symptomatology and course. It is especially to be observed that the tumor masses in the condition which I have described show a different distribution (vide supra), and disappear as the result of treatment successfully directed to the associated, and most probably causally related, general obesity, while in adenolipomatosis the local masses of fat tissues seem to enjoy an individuality, "preserving their volume during conditions under which the patients generally become cachectic, and even in the presence of considerable emaciation secondary to tuberculosis, Bright's disease, etc."

C. Feer,[3] after inviting attention to the fact that localized fatty tumors have been described under the titles of painful subcutaneous tubercle, irritable tumor, states that adiposis dolorosa is the association of nerve pain with obesity. This writer claims that in many instances the pain persists after the removal of the fatty tumors, and that the two symptoms—nerve pain and obesity—may arise at different times and run a course by no means concurrent. I have in my possession notes of cases resembling adiposis dolorosa in which the symptom pain has undergone decided exacerbations and remissions despite the persistence of the fatty tumors. These cases, it seems to me, are to be differentiated from those which I have reported, or those dependent upon obesity, in which a disappearance of the localized fatty tumors is accompanied by a permanent subsidence of all pain (when present), usually moderate in degree.

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[2] Nouv. Icon. de la Salpêt., 1900.

[3] Rev. de méd., August, 1901.

It may be questioned whether the results reported in these cases may be properly classed as cures. The concurrent recurrence of the localized fatty tumors and general obesity in Case II and their complete disappearance for a second time indicate that a cure is possible in all cases in which the probable cause (polysarcia) is amenable to hygienic and regiminal measures. In Dercum's disease the usual results of efforts at treatment are diametrically opposed to those obtained in my cases.

THE CHOICE OF OPERATION IN PYLORIC STENOSIS.[1]

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Pyloric obstruction, whether of benign or malignant origin, is one of the most important problems in gastric surgery. I was influenced in choosing this subject for my paper: (1) By the fact of its very general interest to the profession at large; and (2) because the whole field of gastric surgery is manifestly too large to be satisfactorily covered in the limited time at my disposal. Indeed, it has many phases, the consideration of which could very profitably occupy more than the whole of my allotted time. For the sake of brevity, I shall still further limit myself to a consideration of strictures of the pyloric orifice of an organic nature, leaving entirely out of account the interesting but indefinite group of functional and spasmodic affections.

By common consent, and from its essential mechanism, the management of pyloric stenosis is placed beyond the border line of medicine, within the domain of surgery; and rightly so, since it is clearly a surgical problem, pure and simple. Even the most ardent advocate of medical treatment will hardly claim more than temporary benefit from therapeutic measures alone. Medicine cannot solve a problem in mechanics. For permanent relief from his malady the patient must turn to the surgeon. The sooner this fact becomes firmly established in the medical mind, and is allowed to control its action, the sooner will one of the chief causes of that standing reproach to the medical profession, the "chronic dyspeptic," be removed.

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[1] Read at a meeting of the Virginia State Medical Society, November 14, 1907.

In seeking relief from a given condition, a consideration of the causes giving rise to it, will often prove of great advantage. Pyloric obstruction in the adult, whatever its nature, has its origin, in the vast majority of cases, in an active or healed ulcer. Pyloric stenosis occurring in infancy is a separate and distinct entity, and will be referred to later. For the certain knowledge of the important part played by gastric ulcer in the etiology of gastric cancer, the medical profession is indebted primarily to the surgeon. In this connection, reference should be made to the notable contributions of Rydygier,[2] Rodman,[3] and more especially the Mayos.[4] More recently these observations have been abundantly confirmed by a wider experience and by other surgeons.

A study of the conditions associated with the production and further continuance of gastric ulcer ought to prove instructive in this connection, since it plays such an important part in the etiology of pyloric obstruction. Then, too, a knowledge of the phenomena presented in the life history of a gastric ulcer will help to explain certain symptoms frequently observed in the course of pyloric obstruction which might otherwise be obscure and difficult of correct interpretation. In this way the diagnosis of pyloric stenosis, whether benign or malignant, not by any means always easy although usually possible, is rendered more simple. But all this, however pertinent and and helpful it might be, would lead us too far afield. Suffice it to say that a clear conception of the close relationship existing between these two conditions, namely, ulcer and cancer, will aid materially in the proper understanding of its pathology, diagnosis, and treatment.

A diagnosis, then, of pyloric obstruction having been made, and the condition being admittedly a surgical one, and amenable to surgical treatment only, the surgeon's chief concern at once becomes the choice of operation. In making this choice, he should be influenced not alone by one, but by many considerations. In the first place, the personal equation of the operator, and the patient as well, should not be disregarded. Some particular form of operation, through greater familiarity and experience with it, or for technical or other reasons, he may be able the better to perform than some others. A surgeon may begin an operation with his plans all laid and his mind made up to follow a certain definite line of action, to perform a posterior gastro-enterostomy, for instance, when after the abdomen has been opened, he is confronted by unexpected conditions, which, if he has the best good of his patient at heart, may compel him to change entirely his method of procedure. This sounds elemental in a company such as this, and it is, but I fancy that every operator has experienced the temptation to carry out preconceived plans in spite of opposing conditions. One should always begin every opera-

[2] Centralbl. f. Chir., 1906, Beilage Nr. 28.

[3] Trans. Amer. Surg. Assoc., 1900, xviii, 38.

[4] Annals of Surgery, 1904, xxxix, 321; 1905, xlii, 641; 1905, xliii,. 537.

tion, particularly upon the abdominal viscera, with an open mind prepared to do that which is indicated by the pathological condition found to be present.

The condition of the patient should always be one of the first considerations in determining upon a given course. Operative procedures, involving undue manipulation or great length of time, may be absolutely contra-indicated in a weak or debilitated patient. It is well to bear in mind that the least one can do that is at all effective, is often the best that one can do. In no class of cases is this more true than in those unfortunates suffering from advanced cancer of the stomach with marked obstructive symptoms. Here a rapidly performed anterior gastro-enterostomy done, perhaps (in order to further shorten the time of operation), with the aid of a Murphy button, always a doubtful procedure, may become the operation of choice.

After the general considerations, some of which I have indicated, come the special ones, and in a patient in otherwise good condition they will most likely determine the choice of operation.

In the case of pyloric obstruction, the result of early cancer, the attempt at extirpation should always be made. In other words, pylorectomy is here the operation of choice. The mortality is but little, if any, greater than in the palliative operation of gastro-enterostomy, while the relief of pain and other disagreeable symptoms is more sure, and the average length of life appreciably greater. In those unfortunate cases in which by reason of adhesion to and invasion of surrounding structures the cancer has progressed beyond the point of extirpation, a gastro-enterostomy is the only thing that offers even temporary relief, and should be done as a last resort. This operation performed under these most unfavorable conditions shows a very high mortality rate, anywhere from 15 to 50 per cent., depending upon the operator. The average prolongation of life is not more than three to six months, and the fact that a patient occasionally lives beyond this time suggests the possibility that with a more radical procedure he might have lived even longer (Murphy).

The operation of pylorectomy has been placed upon a very firm pathological basis by the classical work of Billroth, Kocher, Mikulicz, Hartmann, Mayo, and others. The later reports from the different clinics show a very low rate of mortality, that from the Mayo Clinic, 9.5 per cent., being the most satisfactory. The technique as given by Mayo is perhaps the simplest. I will not take up your time with a description of it, but refer you to his paper. This operation can be performed by the average operator in from one to one and one-half hours. The anastomosis is effected by the Billroth "No. 2" method, that is, the complete closure of both duodenal and gastric stumps with an independent posterior gastrojejunostomy. This is the operation of choice, both on account of the ease of accomplishment and safety. Personally, I have had great satisfaction with this operation in the limited number of cases in which I have performed it—eight times without a death.

Great difficulty is sometimes experienced, after the abdomen has been opened, in distinguishing between an early carcinoma and the indurated and hypertrophied gastric wall about a chronic ulcer. Indeed, at times it is absolutely impossible to make a diagnosis from gross appearances alone, even after the specimen has been removed. In conjunction with Dr. Julius Friedenwald I reported such a case at the last annual meeting of the American Gastro-enterological Association in Altantic City. Similar cases have been reported recently by Bloodgood and Lund. In the case just referred to the clinical diagnosis was ulcer. At the operation on account of the indurated tumor and the infiltration of the stomach wall and the fat along the lesser curvature, the diagnosis of cancer was made. In the laboratory, on gross inspection, it was at first supposed to be cancer; but later microscopic examination of sections revealed nothing but inflammatory tissue. In another case upon which I operated some years ago in which clinically almost identical conditions prevailed, a very early cancer was discovered only after careful microscopic examination of sections through the base of the ulcer. The lesson to be learned from these observations tends to confirm Rodman's contention that, in case of doubt, especially in persons past middle life, and in ulcers that have run a chronic course, or in which there is much cicatricial tissue present, pylorectomy, from the standpoint of prophylaxis as well as cure, is the operation of choice.

Heretofore, we have been dealing with the actual existence of carcinoma, or with conditions in which its presence may be reasonably suspected. In the cases of benign obstruction, however, it will be found for one reason or another that the choice of operation will eventually lie between gastro-enterostomy and some other surgical procedure, pylorectomy, pyloroplasty, gastro-duodenostomy, etc. I have already discussed the conditions under which pylorectomy should be given the preference. It now remains to consider the circumstances which should influence one in making a choice between the other operative procedures. Many arguments have been advanced, based upon physiological and other grounds, theoretical and practical, both for and against the operation of gastro-enterostomy; but at present it is, with the majority of surgeons, the operation of choice. Undoubtedly upon strictly physiological grounds, the advocates of pyloroplasty and gastroduodenostomy have the better of the argument. The clinical fact remains, however, that whatever the outcome under other circumstances, in the majority of cases of pyloric stenosis, properly selected and properly done, the operation of gastro-enterostomy is followed by satisfactory results. This fact influences greatly, and rightly so, the course of action of most surgeons in determining upon the particular operation to be performed.

The various arguments for and against these two procedures have been from time to time brought out by different writers, notably the excellent article of Cannon and Blake.[5] More recently, the studies in the physiology of altered digestion and the metabolism of fats, following these operations made by Katzenstein, Joslin, Murphy, Patterson, Leggett and Maury,[6] and others are of interest and value. In this connection Paterson's[7] conclusions are worth quoting in full as embodying the latest ideas upon the physiological effects of gastro-jejunostomy: "(1) A certain amount of bile and pancreatic juice enters the stomach after gastro-jejunostomy, but the amount is small and has no injurious effect. (2) The acidity of the gastric contents is markedly diminished, usually about 30 or 35 per cent. This is due partly to a diminution of the total chlorides secreted, and partly to the partial or complete neutralization of the free hydrochloric acid by the alkaline bile and pancreatic juice, and probably also to earlier stimulation of the pancreatic secretion, and compensatory earlier fall of the gastric secretion. In gastric ulcer cases the removal of spasmodic stenosis of the pylorus, likewise tends to diminish the total acidity. (3) Gastric digestion is impaired but not lost after gastro-jejunostomy. (4) The motility of the stomach, if normal before operation, is for practical purposes unaffected. Gastrojejunostomy is, therefore, not a drainage operation. Its beneficial effects on gastric ulcer are due to the diminution of the acidity of the gastric contents. (5) Gastrojejunostomy has no material effect upon the metabolism of the human body, the percentage of nitrogen and fat absorbed being within the limits observed in individuals who are apparently healthy. This chemicopathologic evidence is supported by evidence of clinical experience."

Further observations along these lines after long periods of time will have to be awaited before any very definite conclusions are warranted.

As indicated above, gastro-enterostomy is the operation of choice on the part of most surgeons, and its field of usefulness is being constantly widened. This is true largely because the technique of the operation has been greatly simplified. The composite "no-loop" operation described by W. J. Mayo in 1906 is a fairly simple operation, and can be readily performed by surgeons without any special training in abdominal surgery. The results of this operation have been on the whole satisfactory, especially in the larger clinics, where the mortality has become merely nominal—a fraction of 1 per cent.—and the functional results, according to the published reports, excellent. It must be observed, however, that this operation is one which, in order to obtain the best results, requires upon the part of the operator a considerable amount of skill and experience in its performance.

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[5] Annals of Surgery, 1905, xli, 686.

[6] Ibid., 1907, xlvi, 549.

[7] Trans. Section on Surg. and Anat., Amer. Med. Assoc., 1907, p. 80.

According to the published reports, the results of the occasional operator are found to be not nearly so satisfactory as those obtained in the hands of the more skilled and experienced surgeon. This is a point of considerable importance, and one that has not been sufficiently emphasized. The same is true, to a certain extent, of the operation of pyloroplasty or gastroduodenostomy, but here, owing to the different mechanism and less complicated technique, the results in the hands of different operators are likely to be more constant. Unfortunately, in the case of neither operation have the end results been observed long enough, or have they been studied with sufficient care and detail, to enable one to state accurately the relative advantages and disadvantages of the two methods. Both have their good points. Each has its objections.

From a purely physiological standpoint it seems that the advocates of the pyloric operation have the advantage, but unquestionably the clinical results obtained after gastro-enterostomy in the presence of obstruction are better than the physiologists would have us believe. In discussing the relative advantages and disadvantages of the pyloric operations and those in which the stoma is placed at some distance from the pylorus along the greater curvature of the stomach, I shall consider the "no-loop" operation of Mayo as the best type of the gastro-enterostomy operation, and the plastic operation on the pylorus described by me in 1903, as the most satisfactory type of the pyloric operation.[8] The advantages of the Mayo operation over all other forms of gastro-enterostomy except as indicated above, in which a hurried operation for advanced cancer is to be performed, are so obvious as to need no further discussion.

One must not forget that gastro-enterostomy performed in the presence of an obstructed pylorus is a much more satisfactory procedure than when the pylorus is unobstructed. Hence, better results are to be expected from the operation done under the conditions with which we are dealing in this paper than under other circumstances.

The chief idea in placing the stoma at the most dependent portion of the stomach, is to bring about better drainage, by calling in the aid of gravity. This assumes that the stomach is a relatively passive bag. But as pointed out by Cannon and Blake, this is not the case. The stomach is at no time during digestion in the condition of a passive reservoir, but vigorous peristaltic waves continue to pass over the pyloric half of the stomach, from within a few minutes after food is ingested, until it has entirely emptied itself. It would appear from the experiments of these observers carried out upon cats, and those of other experimenters upon dogs, that as long as there is even the slightest opening through the pylorus, a certain amount, at least, of food will continue to pass through it. It will be objected by some that it is a far cry from the stomach of a healthy cat or dog to that of a diseased human being; but the underlying physiological principle is the same, and the question of drainage of the stomach through the newly formed stoma, or the production of physiological rest of an ulcerated or contracted pylorus through the same means, must remain for the present in doubt.

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[8] Johns Hopkins Hospital Bulletin, 1902, xiii, 155.

Among the specific objections that have been urged against gastro-enterostomy are the development of peptic ulcer of the jejunum. Some 33 cases, many of them fatal, of this interesting condition have been reported in the literature up to the present time, The affection seems to be much more rare in this country than abroad, but a single case having been reported here in the human being. Watts has observed it once in a dog. The exhaustive monograph of Gosset, published in 1906, brings the subject up to date, and shows that it occurs much more frequently in males than in females; and that it occurs with slightly greater frequency following anterior operations than posterior. No case, so far as I can find, has been reported after the "no-loop" operation, nor has it followed operation for cancer. The causes of this interesting affection are not definitely known, but its relation to marked hyperacidity seems to be pretty constant. As pointed out by Robson, many more cases have probably occurred, but have passed unrecognized because they were non-perforating or obscured by other complications.

The development of spur-formation, the formation of kinks of the intestine, and the presence of the vicious circle, so common in the older loop operations, are now by the later and more improved methods happily rarely met with, but when they do occur they are of the greatest gravity, and in their management tax the resources of the surgeon to the utmost.

The advantages of pyloroplasty are obvious, preserving, as it does, the natural anatomical and physiological outlet. A year ago I reported a three years' experience with this operation, covering a list of 33 cases.[9] During the past year I have operated upon 12 additional cases, making 45 in all. In this series of cases I have endeavored, as far as possible, to test the method in all classes of benign stenosis of the pylorus and its attending complications. In this list are included examples of practically every condition with which one is likely to meet, namely, dilatation of the stomach, dense adhesions, hypertrophy and cicatricial thickening of the stomach wall, acute and chronic ulceration, hemorrhage, pylorospasm, etc. The results thus far obtained have been most satisfactory. I have found no case in which the operation was contra-indicated, or could not be performed. The objections urged against it, namely, difficulty of performance in the presence of adhesions and dense cicatricial tissue about the pylorus, are, in my experience, more fanciful than real. I have performed the operation many times in the presence of adhesions and cicatricial tissue of the densest character. The ease with which it can be performed depends largely upon what Kocher[10] has called "mobilization of the duodenum." This procedure was first suggested and insisted upon in my original paper, and if the duodenum is sufficiently freed to allow of its being brought easily into apposition with the stomach wall, as is possible in practically all cases, the difficulties of the operation will be largely done away with.

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[9] Surg., Gyn., and Obs., 1906, vol. ii, p. 163.

This operation has the additional advantage that it renders possible the excision, when it is deemed advisable, of an ulcer, active or bleeding, or cicatricial tissue, from the anterior gastric or duodenal wall. I have on several occasions been able to do this. It is perfectly possible to provide a pylorus of ample diameter. One should, however, not make the opening too large, as it might give rise subsequently to disagreeable regurgitation of bile, which has been observed by Mayo. One of the most satisfactory features of the operation is the almost entire absence of postoperative nausea and vomiting. Just why this should be so I do not know, unless it has to do with the division of the pylorus, and the doing away with pylorospasm. In the majority of cases relief has been immediate and marked, but Munro[11] has found that it came a little later in his cases than it did after the operation of gastrojejunostomy. The mortality rate is about the same, perhaps a little better, than that of gastro-enterostomy. Dr. Julius Friedenwald has kindly studied the digestive changes present in a number of my cases, both before and after operation. His reports show uniform restoration to a practically normal condition of the stomach, both as to size, function, and motility.

The technique of the operation as originally reported by me has been modified by Gould,[12] and the majority of operators who use it at all prefer this modification, making use of intestinal clamps. I still prefer the original method and the interrupted mattress suture of Halsted, believing the clamps to be unnecessary, and for the anterior wall, at least, the interrupted to be safer than the continuous suture, particularly in the presence of dense cicatricial tissue. I would, therefore, in all cases of benign stricture of the pylorus give the preference to pyloroplasty as against gastro-enterostomy, believing that it better than any other method fulfils the conditions to be met.

Stenosis of the pylorus in infancy, as indicated at the beginning of this paper, is a distinct pathological entity and should be considered by itself. Scudder,[13] in a recent monograph, has collected 155 cases

[10] Zeitsch. f. Chir., January 10, 1903, Nr. 2, p. 33.

[11] Annals of Surgery, 1907, xlv, 818.

[12] Operations upon the Stomach and Intestines, 1906, p. 225.

[13] Boston Med. and Surg. Jour., 1907, clvii, 321.

reported in the literature. There is uniformly found a tumefaction occupying the position of the normal pylorus. This consists of a hyperplasia of the circular, muscular fibers of the pyloric segment. Various theories of the etiology have been advanced, all interesting but unsatisfactory.

As to the choice of operation for this very interesting pathological condition, Scudder has this to say: "Pyloroplasty and gastroduodenostomy, whether of the Kocher or Finney type, are theoretically and physiologically ideal procedures. Posterior gastro-enterostomy is proved to be physiologically satisfactory, and in these cases of infantile stenosis is certainly anatomically the choice of all procedures." Whether the obstructed pylorus recovers itself after the gastro-enterostomy and functionates naturally after a time, is as yet undetermined, because there are no records of autopsy findings long after operation. Meanwhile owing to the peculiar pathological conditions present and the difficulty of manipulation on account of the small size of the structures dealt with, gastro-enterostomy should probably be given the preference.

Personally, I am wedded to the operation of pyloroplasty because I do it better than any other, and now perform it altogether, except in case of malignant disease. I have been led to this position by the fact that my results have been so much more satisfactory with this operation than with any method of gastro-enterostomy that I have employed. I have found it easier of execution and requiring less time in its performance than gastro-enterostomy. It is only fair to add, however, that my results after Mayo's "no-loop" operation in cases of gastric cancer have been most gratifying. In the final decision, then, as between these two methods of precedure, since both are attended by an equally low rate of mortality and both give clinically excellent results, the individual operator should be guided for the present in his choice of operation by his own personal equation. Having at all times, first and foremost, the good of his patient at heart, he should choose that particular method which has been followed by the best results in his own hands, being zealous at all times to perfect himself in those methods having a sound physiological and pathological basis.

THE OCCURRENCE OF CONGENITAL ADHESIONS IN THE COMMON ILIAC VEINS, AND THEIR RELATION TO THROMBOSIS OF THE FEMORAL AND ILIAC VEINS.

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In 1906 I presented to the Anatomical Section of the British Medical Association at its Toronto meeting a preliminary notice of certain congenital adhesions occurring in the left common iliac vein.[1] Since then I have continued my observations on material from the Anatomical Laboratory of the University of Michigan, and also upon a number of veins obligingly placed at my disposal by Dr. Downey L. Harris, City Pathologist of St. Louis, Mo. I have thus been able to examine altogether the iliac veins of 107 individuals, and can confirm and add to the results given in the earlier communication.

The adhesion consists of a fusion of the anterior and posterior walls of the vein, a diminution or division of its lumen being thereby produced. In many cases it takes the form of a column extending between the two walls of the vein (Fig. 1), sometimes circular, and from 1 to 4 mm. in diameter, at other times more oval, its longer diameter reaching as much as 6 mm.; it varies in height and position, in the majority of cases being situated lateral to the median line of the vein, so that the lumen to the medial side of it is greater than that to the lateral side.

In a second type the adhesion was marginal in position, occurring at the lateral border of the vein, so that the lumen was merely diminished but not divided. Of this type two subordinate forms may be distinguished, the more important of these being that in which the adhesion is of a more or less triangular form (Fig. 2), its base, corresponding to the lateral border of the vein, measuring from 8 to 18 mm., while its height varies from 5 to 10 mm. in different individuals. In such cases there is a somewhat sudden diminution of the lumen of the vein corresponding to the height of the adhesion. In the other subordinate type (Fig. 3) the adhesion is a linear one along the outer border of the vein, and may readily be overlooked; it produces but little diminution of the caliber of the vessel.

A third type (Fig. 4) differs from that just described in that the adhesion is at the medial border instead of at the lateral border of the vein. Examples of this type are rare, only two having been observed, but in both these the adhesion produced a very marked diminution of the lumen, reducing it to about one-third the diameter which it possessed above and below the adhesion. The fusion extended from a point on the medial border of the left common iliac vein at its junction with the right common iliac, and extended up-

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[1] British Medical Journal, 1906, II, 1699.

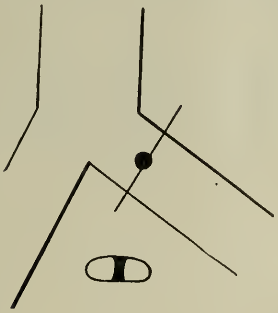

FIG. 1

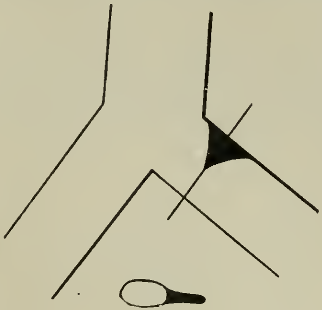

FIG. 2

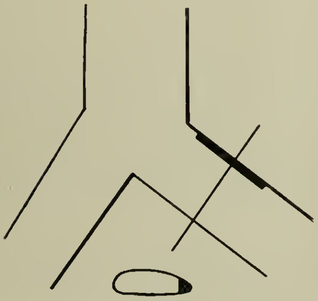

FIG. 3

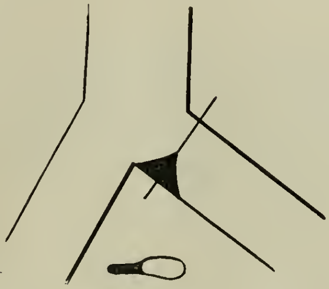

FIG. 4

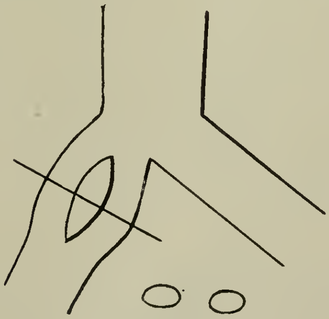

FIG. 5

In the figures the veins are represented as transparent and the adhesion is indicated in solid black. A diagram of a transverse section of the vein passing through the adhesion is also given in each case.

ward and outward so as to have an elongated triangular form and to lie almost at right angles to the axis of the common iliac vein.

Finally, a fourth type (Fig. 5) may be recognized, in which a perforation replaces the adhesion, the vein being double for a limited portion of its extent. Examples of this type are the rarest of all, but one having been observed; nevertheless, it is most important from a morphological standpoint, in that it affords a possible explanation for the occurrence of the more frequently occurring adhesions.

The frequency with which the adhesions occur is somewhat remarkable. In the 107 cases examined adhesions occurred in 35, making a percentage occurrence of 32.7. These adhesions were distributed according to the different types mentioned above, as follows:

Type I.	Columnar	15
Type II.	Marginal:	
	(*a*) Triangular	11
	(*b*) Linear	5
Type III.	Medial	2
Type IV.	Perforated	1
Total		34

One case is not included in this list, inasmuch as it presented what seemed to be a combination of types II*a* and III, a strong adhesion projecting from the lateral border of the vein medially, and another occurring at the medial border, so that the interval between the free edges of the adhesions was only about 1 mm. broad, the diameter of the vein immediately above and below the line of the adhesions being 1.5 mm.

A most striking peculiarity in the distribution of the adhesions was their enormous preponderance in the left vein as compared with the right. Of the 35 adhesions observed, but 3 were in the right vein, the percentage of occurrence in the left vein being 29.9; or, in other words, the adhesions in the left vein formed 91.4 per cent. of the total number. Whether the frequency of occurrence differs in the two sexes, my observations do not permit me to say with any degree of certainty, since out of the 107 individuals examined, but 17 were females. Of these, 4 showed adhesions, this number being 23.5 per cent. of the total number of females examined. The number examined was, however, too small to give this figure definite value.

The significance of these data in connection with the occurrence of thrombosis of the femoral and iliac veins seems to be very great. I do not intend to discuss the proximate causes of this thrombosis, as these lie entirely outside my province. But it is clear that any arrangement tending to interfere with the flow of blood through the veins must act as a contributory cause, and, therefore, a factor in the etiology of the trouble. It is well known that a large majority of the thromboses occur upon the left side, and it seems altogether reasonable to associate this fact with the preponderating occurrence of the adhesions described above upon the left side. Virchow long ago pointed out that the anatomical relations of the right common iliac artery and the left common iliac vein might well contribute to the occurrence of thromboses on the left side, the artery as it crosses the vein exerting a certain amount of pressure upon it and thereby tending to produce some stasis or retardation in the flow of the venous blood. Add to this the occurrence of adhesions in the left vein in nearly 30 per cent. of the individuals examined, and we surely have a combination of conditions which warrant an association of the anatomical with the pathological phenomena.

Sex.	Age.	Cause of Death.	Type of adhesion.	Vein in which adhesion occurred.
Male . . .	51	Fatty degeneration of heart.	I	Left.
" . . .	58	Carcinoma of stomach.	II*a*	"
" . . .	29	Chronic interstitial nephritis.	II*a*	"
" . . .	41	Lobar pneumonia.	II*a*	"
" . . .	36	Mitral insufficiency	I	"
" . . .	39	Acute fibrinous peritonitis.	I	Right.
" . . .	31	Psoas abscess.	II*a* and III	Left.
" . . .	65	Acute miliary tuberculosis.	II*a*	"
" . . .	32	Mitral and aortic insufficiency.	I	"
" . . .	70	Valvular disease of heart.	I	Right.
" . . .	70	Nervous prostration.	II*b*	Left.
" . . .	72	Senile dementia.	II*a*	"
" . . .	40	Pneumonia.	III	"
" . . .	82	Exhaustion.	II*b*	"
" . . .	?	Kidney disease.	I	"
" . . .	56	Chronic mental disease.	I	"
" . . .	83	Heart disease.	I	"
" . . .	42	Peritonitis.	IV	Right.
" . . .	44	Apoplexy.	II*b*	Left.
" . . .	56	Pneumonia.	II*a*	"
" . . .	40	Pulmonary tuberculosis.	II*a*	"
" . . .	75	Dysentery.	II*a*	"
" . . .	63	Dysentery.	II*a*	"
Female . . .	49	Acute dilatation of heart.	III	"
" . . .	39	Cerebral hemorrhage.	II*b*	"
" . . .	48	Fracture of base of skull.	II*a*	"

As regards the causation of the adhesions, I have little to add to the opinion expressed in my preliminary communication. That was to the effect that the adhesions are congenital in their nature, due to the incomplete disappearance of a loop by which the iliac vein in the embryo originally surrounded an artery, probably the umbilical. Of the existence of such a loop we have evidence from what has been observed in certain of the lower animals, and it is interesting to note that a perforated condition of the vein, a condition practically producing a loop arrangement, is among one of the types of adhesions recognized above. Furthermore, it may be noted that the extraordinary frequency of the occurrence of the adhesions on the left side as compared with the right is in harmony with this idea, the pressure of the right artery upon the vein being probably the cause by which an inhibition of the development, normally resulting in the complete disappearance of the loop, has been produced. The adhesions in the great majority of cases occur at the level at which the crossing of the vessel takes place. At the same time it must be recognized that the pressure of the artery is not in itself the cause of the adhesions; the occurrence of isolated cases in the right vein and of occasional cases in the left vein considerably below the level at which it is crossed by the artery being evidence of an ulterior cause, which I take to be the embryonic loop. It may be added that the study of sections taken through two suitably preserved veins in the region of the adhesion showed no evidence of inflammatory or other pathological processes.

The accompanying table shows the sex, age, cause of death, and type of adhesion in the majority of cases observed. In a few cases the necessary data were lacking, and in some instances the data in the third column are wanting in precision, but are given as furnished.

ACUTE GLANDULAR FEVER.

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The lack of consideration of acute glandular fever as an independent disease, having a distinct and characteristic entity, or as probably being an aberrant form of influenza nostras, typhoid fever, or some other acute infectious disease, and the prevalence of many cases of fever of 101° to 104° F., with daily remissions of 1° to 2°, in which no positive diagnosis has been made, was the stimulus to investigate acute glandular fever as a common malady, and claim for it consideration and a conspicuous place among the acute infectious fevers.

Definition. Acute glandular fever is an infectious disease developing, as a rule, without premonitory signs, and characterized by slight redness of the throat, high fever, and swelling and tenderness of the lymph glands of the neck, particularly those behind the sternomastoid muscles. The fever is of short duration, but the glandular hypertrophy persists for from ten days to four weeks.

Historical. The disease was first recognized by Pfeiffer, of Weisbaden, in 1889, who called especial attention to it under the name of "Drüsenfieber." Since Pfeiffer's description of the disease cases have been reported by numerous authors, mostly in Germany and France. Heuber, Dawson Williams, Comby, Donkin, and J. P. West have contributed largely to the literature of glandular fever, but the disease continues to be considered uncommon and insignificant among infectious diseases.

ETIOLOGY. It occurs endemically and sporadically, especially among children. Exposure to cold and damp is supposed to have some relation to the disease. Eighty per cent. of all cases reported since its recognition have occurred in children. Byers reports 33 cases, in which the youngest was thirteen months and the oldest twenty-five years old. F. Marsh Dolloway reports 4 cases in adults twenty-four to forty-two years of age. Neuman claims it is due to a streptococcic infection, the organism entering by way of the tonsils without producing any local lesion, while H. Koplik suggests infection may be by way of the thoracic duct. Alerand, in France, has investigated thoroughly and written extensively on the atrium of infection through the nose and throat, and the relation to tuberculosis. It has been suggested that the disease may be a peculiar form of influenza.

SYMPTOMATOLOGY. The period of incubation is from five to seven days. The onset is usually sudden, the patient complaining of headache, pain in the abdomen, vomiting, anorexia, and probably chills. The bowels are constipated, but the patient may rarely suffer from diarrhœa; the tongue is coated, and the face flushed; the evening temperature is 102° to 104° F., while the morning temperature is a degree or a degree and a half lower. The pulse rate is 90 to 130. On the second to the fifth day the enlarged glands appear, and during the course vary in size from a pea to a pigeon's egg, are quite tender, but there is rarely any redness or swelling of the skin. The swelling of the glands persists for two or three weeks. In the severe cases headache is always complained of as an initial symptom, together with abdominal pain and vomiting. Byers, in his series of cases, found the throat unaffected beyond a slight congestion. Many of the patients complained little or not at all until the glands of the neck seemed suddenly to enlarge. The glands affected were the deep ones under and in front of the sternomastoid muscle. No suppuration occurred in any of the cases and the enlargement of the glands subsided in a week or two. The lymph nodes are hard, tender, freely movable, and form a regular chain around the neck. The axillary and inguinal glands are most always involved, the spleen is enlarged in 80 per cent. of the cases, and the liver in 90 per cent. Mesenteric glandular enlargement was found in 40 per cent. Convalescence is, as a rule, very rapid, and uninterrupted by complications.

DIFFERENTIAL DIAGNOSIS. *Acute leukemia* in the early stages closely resembles glandular fever. Differentiation is made by blood examination, the leukocytosis in leukemia being marked and persistent, 1 to 30 to 50 being the relation of white to red cells.

Anemia is pronounced and progressive, and the temperature of longer duration than in glandular fever. A differential leukocyte count shows the predominance of lymphocytes or myelocytes.

Syphilis is excluded by a history of initial lesion or lues in the parents, by marked anginose symptoms, and cutaneous eruptions, together with response to mercury.

Pseudoleukemia. In Hodgkin's disease the glandular enlargement is at first unilateral, and is accompanied by progressive emaciation with marked anemia, œdema, and late pyrexia, the fever usually being intermittent.

Tubercular adenitis is excluded by the presence of a tubercular history. The glandular involvement is usually localized and accompanied by redness and tumefaction of the skin, with suppuration. The fever of tubercular adenitis is of longer duration than that of glandular fever. By reaction to tuberculin or demonstration of tubercle bacilli in the sputum, the diagnosis is corroborated.

CASE I.—W. W., male, white, aged sixteen years; born in West Virginia; occupation, farm laborer; well nourished and developed. Brought to hospital on morning of August 31, after having been confined to house two days. Complained of headache, pain, and stiffness in neck, pain in abdomen, cough, and weakness. The temperature on admission was 104° F.; pulse, 96; respirations, 28. The patient gives no history of disease predisposed to by heredity. No history of prodromes preceding confinement to house, and was perfectly well two days previous to admission to hospital.

The face was flushed, expression calm, eyes bright, decubitus dorsal recumbent. The skin was dry and fine. The glands of the cervical region very slightly enlarged, the neck somewhat stiff and tender. No redness of skin above the glands. Tonsils, nasal and oral pharynx, slightly hyperemic. Examination of chest gives negative physical signs. The heart was normal, the pulse-rate 96, the pulse full. Blood pressure, 115 mm. The pulse declined gradually with the fever and remained of good quality and volume. Blood pressure, 130 mm. on fifth day.

Examination of Blood. Malarial parasite negative on the second and sixth days. Widal reaction negative on the second, sixth, fourteenth, and twenty-first days. Red blood count, 4,000,000; hemoglobin, 90 per cent.; leukocytosis, 14,000 on the sixth day, 8900 on the twenty-first day.

The temperature reached fastigium (104.6° F.) on the fourth day and persisted, with slight daily remissions of 1° to 2°, until the seventh day, when the temperature, declining by lysis, became normal and so remained.

Gastro-intestinal symptoms present were anorexia, fetid breath, tongue moist, swollen, and heavily coated, with reddened tip and edges. Spleen markedly enlarged. Liver slightly enlarged. Abdomen tender on pressure. Stools well digested. No tympanites, distention, or diarrhœa present preceding, during, or following the disease. Slight dysphagia. Rose spots negative. The glandular hypertrophy, pain, and tenderness first noticed in the postcervical region later became evident to a less prominent degree in the axillary and inguinal regions. The mesenteric glands were never palpable. The pain and tenderness over the glands ceased with the decline of fever, but the glands remained discretely enlarged, though diminishing, at the time patient was discharged. Examinations of sputum for Bacillus tuberculosis proved negative on two occasions during the course of the disease.

Case II.—S. F., female, white, aged twenty-seven years. Patient was taken ill with headache, anorexia, abdominal pain, and slight dysphagia. Temperature, 103° F.; pulse, 96; respirations, 26. Glandular enlargement became evident on the fourth day of disease. The glands were not painful, but slightly tender on pressure and unaccompanied by redness of skin or tendency to suppuration. The temperature became normal on the eighth day, and so remained; the glandular enlargement persisting for over three weeks. Convalescence was uninterrupted and not followed by prostration or anemia. Patient was kept confined to bed for five weeks after cessation of the fever because of glandular condition, although the general condition was good after the return of temperature to normal. Widal reaction negative on the eighth day; leukocyte count, 7000 on the eighth day. A tentative diagnosis of enteric fever was made in both instances, but was later abandoned in the absence of frank symptoms.

Glandular fever presents many of the characteristics of influenza, and may probably be associated with influenza as an aberrant form. If Bacillus pfeiffer should be found in the secretions, glandular fever should be considered associated with endemic influenza-nostras or la grippe, occurring sporadically as a protean type; but repeated efforts have not demonstrated this association. The highly contagious nature of influenza and pandemic invasions are absent in glandular fever. Splenic and hepatic hypertrophy are rarely present in epidemics of influenza occurring in the United States.

The absence of characteristic features of typhoid fever in these cases, as in a score or more which had come under my observation in the George Washington and Emergency Hospitals, led me to the conclusion that many of these cases are acute infectious diseases other than typhoid. The absence of prodromal symptoms, rose spots, typical pulse, Widal reaction repeatedly tested for, and the presence of glandular hypertrophy with pain and tenderness, the glands remaining enlarged after the cessation of the disease without suppuration, the short duration of the fever, with rapid convalescence, and the presence of leukocytosis during the fever tend to a diagnosis of some disease other than enteric fever. I believe acute glandular

	INFLUENZA.	ACUTE GLANDULAR FEVER.	LEUKEMIA.	TUBERCULAR LYMPHADENITIS.	TYPHOID FEVER.
Onset	Abrupt.	Abrupt.	Gradual.	Gradual.	Gradual.
Causes	B. pfeiffer.	Unknown.	Unknown.	B. tuberculosis.	B. typhosus.
Fever	Remittent or continued.	Continued.	Variable.	Intermittent and remittent.	Continued.
Nutrition	Temporarily impaired.	Temporarily impaired.	Progressive emaciation, weakness.	Emaciation, slight or extreme.	Temporarily impaired.
Weight	Loss followed by recovery.	Loss followed by recovery.	Progressive loss.	Progressive loss.	Loss followed by recovery.
Anginose symptoms	Usually marked.	Absent or very slight.	Absent.	Always present.	Variable.
Spleen	Normal.	Hypertrophied.	Hypertrophied.	Normal.	Hypertrophied.
Blood changes	Slight secondary anemia; slight leukocytosis.	Slight secondary anemia; slight leukocytosis.	Extreme secondary anemia; leukocytosis marked and persistent; marked increase of myelocytes or lymphocytes.	Secondary anemia.	Slight secondary anemia. Leukopenia.
Glands	Rarely involved; always confined to cervical region; never suppurate.	Discretely enlarged, painful, and tender; never suppurate; cervical, axillary, and inguinal glands involved; hypertrophy subsides gradually; pain and tenderness cease with fever.	Markedly enlarged; no pain or tenderness other than produced by pressure; never suppurate; cervical, axillary, and inguinal glands involved; hypertrophy progressively increases, rarely subsides.	Cervical most commonly involved, usually localized; tend to suppurate and coalesce.	Glandular involvement very rare.
Sputum and nasal secretions	B. pfeiffer, probably.	Negative.	Negative.	B. tuberculosis, probably.	Negative.
Duration	Weeks.	Weeks.	Prolonged, months or years.	Months.	Weeks or months.
Widal reaction	Negative.	Negative.	Negative.	Negative.	Positive.
Gastro-intestinal disturbances	Vary; may be slight or severe.	Onset with vomiting; during course resembles typhoid.	Slight at first; more pronounced as disease progresses.	Negative.	Marked.
Glandular enlargement	Follows fever.	On the fourth or fifth day after onset of fever.	First evidence of disease.	Followed by fever.	Follows fever.
Convalescence	Gradual.	Rapid.	Rare or retarded.	Tardy.	Gradual,
Complications	Occasional.	Rare.	Rare.	Common.	Frequent.
Mesenteric enlargement	Never.	40 per cent. of cases.	Late.	Probable.	Rare.

fever to be a very common disease, unrecognized, and that it frequently is mistaken for aberrant forms of typhoid or influenza. From my observation and study of cases, I have become firmly convinced that some cases of enteric fever of short duration have been nothing other than acute glandular fever, and that this disease should be given a more prominent place than it has among acute infectious diseases, not only as occurring among children, but among adults as well. The annexed table may prove serviceable in the differential diagnosis.

EPIDEMIC CEREBROSPINAL MENINGITIS IN HARTFORD, CONNECTICUT, DURING 1904–1905.

WITH SPECIAL REFERENCES TO THE CASES TREATED AT THE HARTFORD HOSPITAL.

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AND
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Connecticut has been visited by three previous extensive epidemics of cerebrospinal meningitis, which have been recorded with painstaking accuracy by the physicians residing in the towns where it was especially prevalent. The first epidemic, continuing from 1806 to 1816, is well known to the student of medical history in this country by the excellent little monograph which Elisha North,[1] then of Goshen, wrote upon it. Dr. Lemuel Bacon, in a manuscript which is still extant, has also discussed this epidemic as it appeared in Hartford. The second epidemic was seen in Middletown in 1823, and formed the subject of a forgotten admirable pamphlet by Dr. Thomas Miner, who called the disease typhus syncopalis.[2] He had previously, also, referred to it in a book, which he and Dr. William Tully wrote, entitled *Essays upon Fevers and Other Medical Subjects*.[3] The third epidemic occurred in 1873, and formed the basis of a paper by Dr. Horace S. Fuller, of Hartford, which, unfortunately, has never been published. The epidemic we shall consider began in March, 1904, and continued, though in a much abated form, until December, 1905.

[1] A Treatise on a Malignant Epidemic Commonly Called Spotted Fever, New York, 1811, pp. 250.

[2] Typhus Syncopalis, Sinking Fever, or the Spotted Fever of New England, as it Appeared in the Epidemic of 1823, in Middletown, Conn., Middletown, 1825, pp. 48.

[3] Essays on Fevers and Other Medical Subjects, Middletown, 1823, p. 484.

The first case, reported April 4, 1904, occurred in the northwestern outskirts of the town, but previously three examples of the malady had been observed at the Hartford Hospital, although they were not then so diagnosed. Following these cases many persons were stricken with the disease, and its epidemic nature soon became thoroughly established. During the two succeeding years 145 cases were reported, most of them occurring during the first three months of the epidemic. If we tabulate the cases as reported, we note during 1904: 2 in March, 45 in April, 45 in May, 19 in June, 4 in July, 1 in August, 2 in September, 3 in October, 2 in November, and 2 in December. In other words, 92 of the cases were observed during the first three months, and 125 of the 145 cases during the first year. In 1905, 2 cases were seen in February, 8 in March, 3 in April, 2 in May, 1 in August, 1 in September, 1 in November, and 2 in December. A few scattering sporadic cases have subsequently been noted almost down to the present time.

Of the 145 cases, 90 were males and 55 females. As to age, the distribution was: one to ten years, 86 cases; eleven to twenty years, 35 cases; twenty-one to thirty years, 8 cases; thirty-one to forty years, 8 cases; forty-one to fifty years, 2 cases; fifty-one to sixty years, 3 cases; sixty-one to seventy years, 2 cases; seventy one to eighty years, 1 case. Or classified thus: from birth to five years, 56 cases; six to ten years, 30 cases; eleven to fifteen years, 18 cases; sixteen to twenty years, 17 cases; twenty-one to twenty-five years, 5 cases; twenty-six to thirty years, 3 cases; thirty-one to thirty-five years, 6 cases; thirty-six to forty years, 2 cases; forty-one to forty-five years, none; forty-five to fifty years, 2 cases; fifty-one to fifty-five years, 1 case; fifty-six to sixty years, 2 cases; sixty-one to sixty-five years, 2 cases; sixty-six to seventy years, none; seventy-one to seventy-five years, 1 case. Thus we see most of the cases occurred in the first two decades—120 in all—and that more are recorded from birth to five years than during any other period. Of the total number (145), 108 died, giving a mortality of 74.48 per cent.

Geographically, most of the cases came from the east side of Hartford, where the population is the densest and largely made up of the lower classes, including the foreign element. Here the hygienic surroundings are frequently at fault. Twenty-two streets had more than one case, and in thirteen streets the cases were near one another, though some were on opposite sides of the street. If we tabulate the cases according to streets, we find one street (Front) had 13 cases, one street (Park) had 6, two streets (Spruce and Main) had 5, three streets (Smith, Liberty, and Talcott) had 4, six streets (Affleck, Avon, Charles, Kilbourn, Market, and Pleasant) had 3, and nine streets (Blumenthal Place, Broad, Buckingham, Chapel Howard, Hudson, Marsh Court, North, and Union) had 2. In eleven instances one house furnished more than one case, and in six of these the cases appeared in the same family, but in only one of the six were there more than two examples of the disease. In this instance four were stricken. In one of these six a girl in the tenement above also came down with the malady. In the other five examples it was seen in those occupying the same tenement. All of the cases save one were in children.

Of the above cases, not sent to the Hartford Hospital, there were 35 which were seen by Dr. F. T. Simpson. He has kindly furnished us with a tabulated list of symptoms, from which we note that 21 had stiff necks, 2 herpes, 15 a petechial eruption, 24 showed Kernig's sign, and in 12 the pupils were dilated (in 2 the dilatation was unequal), while in 2 the pupils were contracted. Diplopia was seen in 2 instances. Of the total number, 25 were in stupor when seen, and 17 were occasionally delirious. All of them complained of headache, 5 of nausea; in 18 there were attacks of vomiting; 11 had chills at the onset, and in 4 convulsions were observed. There were only 8 recoveries.

Fifty-five of the patients were admitted to the Hartford Hospital, and were studied as carefully as possible during the time at our command. Of this number, 37 died, giving a mortality of 78.18 per cent.

Incidence. There were 33 males and 22 females. As to age, the distribution showed: one to ten years, 18 cases; eleven to twenty years, 17 cases; twenty-one to thirty years, 8 cases; thirty-one to forty years, 8 cases; forty-one to fifty years, 1 case; fifty-one to sixty years, 1 case; sixty-one to seventy years, 2 cases. Or, classified by five years: from birth to five years, 7 cases; six to ten years, 11 cases; eleven to fifteen years, 9 cases; sixteen to twenty years, 8 cases; twenty-one to twenty-five years, 5 cases; twenty-six to thirty years, 3 cases; thirty-one to thirty-five years, 6 cases; thirty-six to forty years, 2 cases; forty-one to forty-five years, none; forty-six to fifty years, 1 case; fifty-one to fifty-five years, 1 case; fifty-six to sixty years, none; sixty-one to sixty-five years, 2 cases. Here, as in the total list recorded from Hartford, most of the cases are seen during the first two decades—35 out of the 55 cases—but from birth to five years, the number, proportionately, is somewhat less. This we may explain as due to the fact that some of the cases reported to the Board of Health may have been erroneous diagnoses, and also because the parents would naturally be unwilling to part from their offspring, for hospital treatment, at so tender an age. The oldest patient was sixty-four years old, while the youngest was eleven months. In 2 instances the disease was seen in negroes.

Months. As the cases reported to the Board of Health occurred mostly during the first three months of the epidemic, so we find the hospital cared for the majority of the patients with this malady during that period, when only 4 recovered. In March, 1904, 2 cases were treated; in April, 11; in May, 15; in June, 6; in July, 3; in August, 2; in September, 1; in October, 1; in November, 1, and in

December, 2. During 1905, in February, 2 patients were treated; in March, 4; in April, 2; in September, 1; in November, 1, and in December, 1.

Occupation. Besides the cases seen in schoolchildren, it was found among the laboring classes, for machinists, toolmakers, blacksmiths, drivers, tobacco sorters, pack pedlers, electricians, brakemen, clerks, sailors, and dressmakers were attacked. We know of no examples reported from the well-to-do classes during this epidemic.

Etiology. Of the 55 cases, lumbar punctures were performed in 51, and in 43 of these meningococci were found in smears made from the centrifuged sediment of the fluid removed. The organisms were mostly intracellular and decolorized by Gram. In the very severe cases they were apt to be especially numerous, as many as fifty pairs being seen in one case. In three of the cases there were "dry taps," but in one of these the meningococcus was subsequently cultivated from the spinal fluid at the autopsy. In the five remaining cases the smears were negative, but the cases were all advanced save one. In one of the advanced cases, several lumbar punctures had been earlier performed, from which the meningococcus had been grown; in another, although the smear was negative, yet the meningococcus was later cultivated from a smear of the centrifuged sediment, made on blood serum. Tabulated according to the stage of the disease, 4 lumbar punctures were performed on the first day, 9 on the second day, 9 on the third day, 11 on the fourth day, 5 on the fifth day, 2 on the sixth day, and 2 on the seventh day. In one case the exact day could not be determined, and in eight instances punctures were made later than the seventh day. In one of these the meningococcus was found in the smear, but not in the culture; in another, it had elsewhere been cultivated, in two it was both seen and cultivated, and in three was neither seen in the smear nor cultivated. These last three were very light cases, and recovered. Of the 42 punctures made on the patients during the first week of the disease, the meningococcus was seen in the smear in all but one case (a dry tap), and in 36 of them this germ was cultivated, but in 2 of them it was not grown until autopsy. In 14 cases two punctures were performed, and in 5, three. From all but three lumbar punctures, from 2 to 65 c.c. were withdrawn. The fluid was clear, slightly cloudy, or of a thick, yellow color. The exudate in all was largely composed of polymorphonuclear cells; a few mononuclears were generally present, and, more rarely, some large epithelioid cells. As the disease progressed, in favorable instances, the polymorphonuclear leukocytes diminished in numbers, while the other varieties of cells became more numerous. In each case the fluid was collected in sterile test-tubes and examined after it had been allowed to settle for a short time. If the examination then was negative, the fluid was centrifugalized under antiseptic precautions and again examined. At each puncture if enough fluid was obtained, from 2 to 3 c.c. was run directly into two or three tubes of blood serum, according to the method which Councilman, Mallory, and Wright recommended in 1898, and which Kalberlah has more recently advocated. If by smear the meningococci seemed very few, cultures were also made on blood serum from the centrifugalized sediment. Thus we were able to grow the meningococci in 39 out of the 43 cases from which fluid was obtained. Agar-agar, blood serum, ascitic agar, potato, and bouillon were the media generally employed, and on all the growths were quite characteristic, save that we were never able to detect a pellicle on our bouillon cultures.

In 5 instances we made blood cultures, twice from blood received from the same patient, but in only one of these did we succeed in obtaining any growth. On this occasion we found in pure culture a meningococcus, which grew characteristically on the above mentioned culture media. For these blood cultures, 5 c.c. of blood was withdrawn from the median basilic vein and distributed evenly into two Erlenmeyer flasks, each containing 50 c.c. of bouillon. Smears and cultures were taken from the nose in 41 cases. In 17 of the smears a diplococcus was seen, not decolorized by Gram; in 5 a diplococcus was decolorized by Gram; in 10 a staphylococcus; and in 7 there were very few organisms, with no preponderating type. In one of these a large undifferentiated bacillus was seen, while another showed diphtheria bacilli, which quickly disappeared after the use of antitoxin. Of the cultures, in 20 cases Staphylococcus pyogenes albus alone was obtained; in 7 cases the albus with the aureus was grown; in 7 cases the albus with a diplococcus, which decolorized by Gram and grew on blood serum as a thick pultaceous growth; in 1 case the pneumococcus alone; in another, the albus with the pneumococcus; in 2 cases, diplococci decolorizing by Gram with undifferentiated bacilli; in 2 cases this diplococcus with the aureus, and in another case an undifferentiated bacillus. All of the diplococci which decolorized by Gram presented on the different media the same cultural characteristics, and were evidently Micrococcus catarrhalis. Unfortunately, we were unable to devote as much time to the study of the nose cultures as we had planned to, so only one culture was made from each patient. In 6 cases there was a watery eye discharge, and in 4 one from the nose, but in none of them were we able to grow the meningococcus. Three smears showed diplococci decolorizing by Gram, and some of them were intracellular. In the case from which we grew the meningococcus by blood cultures bloody urine was withdrawn on two occasions by catheterization. This urine contained a diplococcus decolorizing by Gram, which we were unable to cultivate.

During the epidemic but 12 possible examples of contagion were noted. Most of them occurred in the practice of Dr. F. T. Simpson. We give them, along with those observed among the patients treated at the Hartford Hospital: (1) Two brothers slept in the same bed on the night of April 4, 1904. On the following day one of them developed the disease, while the other was attacked four days later. (2) In another instance, two brothers slept in the same bed on April 7, 1904. The next day one was taken sick with epidemic cerebrospinal meningitis, while the other succumbed four days later. (3) Still another example relates to two girls who lived in the same house, in adjoining rooms. They were constant companions and played together April 21, 1904. The following day one came down with the disease, while the other was stricken with it seven days later. The two eventually recovered. (4) A fourth example was seen in a brother and sister, who were attacked one after the other, the interval being thirty-six hours. Both died within twenty-four hours. (5) In the fifth instance, a girl had a very light form of the disease, from which she recovered in ten days. Four days later her younger sister was taken ill with headache, vomiting, and stiffness of the neck. The symptoms lasted about four days and ended in an uneventful recovery. (6) A boy played on the piazza of a schoolmate's house, and next day was taken ill with this disease. One week later his friend, upon whose piazza he had played and with whom he had played, was suddenly stricken with this malady, and shortly thereafter died. (7) A male nurse, who had attended a boy ill with a chill, vomiting, headache, fever, delirium, a petechial eruption, and a tender spine, went to his own home on a Monday. Four days later his own son fell ill with the spotted fever and died the day following. (8) One of the hospital patients came from Park street, and was one of two in a family, who died of this disease. The following is the interesting chain of events: The mother of two children in a family on Smith street attended the funeral of one of the early fatal cases on Chapel street. Subsequently the two Smith street children played with two children of a family living near them, on Park street, and finally themselves contracted the disease four days after the funeral of the Chapel street case. Five days after the Smith street children were affected, the Park street children came down with this malady, and a little girl in the tenement above this last family was stricken two days later. Eventually only one out of these five children survived. (9) The ninth instance records a boy recovering from cerebrospinal meningitis in a house where, later, another person, a subsequent hospital patient, contracted the affection some three weeks after it was observed in the boy. (10) In this case a hospital patient came down with the disease while living in a house on Front street, where, three weeks later, a girl had the same malady, but soon recovered. (11) A hospital patient, a schoolgirl, had, as her constant companion and schoolmate, a friend who walked home with her on the day before she was taken sick, and received from her a violet. This violet the school friend put in her mouth, and, on parting with the subsequent hospital patient, kissed her good-bye. That night the latter developed meningitis, and died the following day, fifteen minutes after admission to the hospital, while the other girl fell ill three weeks later, and died the day following. (12) The last patient in the series treated at the Hartford Hospital was taken ill on December 15, 1905, but his brother had contracted the disease a week previously. Both of them had occupied the same room, and in both the malady was fatal.

On the other hand, there were a number of families in this epidemic, among whom but one example of the affection occurred. One hospital case, a girl, aged five years, had four brothers and sisters, aged sixteen, thirteen, and five years, and seven days old, yet she alone had the disease, which was not prevalent in that neighborhood. If we can rule out a common source of infection, these examples merely point to the fact that epidemic cerebrospinal meningitis is only mildly contagious, thus bearing out the experience of former epidemics.

Morbid Anatomy. Autopsies were performed upon 7 of the 37 fatal cases. Six were men and one a woman. In the most acute case death occurred early on the second day; merely congestion of the bloodvessels of the pia-arachnoid was found. Four other cases showed this congestion very well, but also exhibited a marked purulent exudate following the course of the bloodvessels. In the remaining two cases (death on the sixty-second and three hundred and thirteenth day) no purulent exudate was noted, but the pia-arachnoid was very much thickened and injected. Numerous opaque areas were seen over the brain's surface. In one of the cases there was a slight area of softening in one of the temporal lobes. The exudate was generally more marked at the bases of the brains. With the exception of the very early cases, the spinal cords in the other acute cases were much injected and the bloodvessels were very tortuous. The purulent exudate was more likely to be found on their posterior surfaces, especially in the dorsal and lumbar regions. The spleen was enlarged in only one instance. In 4 cases there was marked pulmonary œdema, and in 2 the lungs were much congested. Chronic interstitial nephritis existed in 3 cases. Old infarcts in the kidneys, spleen, and brain were seen in 1 chronic case, which also showed a slight cerebral hemorrhage over the motor area of the right arm. Cultures and smears were made from the brain and cord of all these cases, except 2, and in the 5 Diplococcus intracellularis meningitidis was recovered. This organism was also found in the celloidin sections showing the exudate and brain substance. Lack of time has prevented us from studying the tissues from the autopsies more thoroughly.

Mode of Onset. A rapid onset was found in all but 7 of the hospital patients. Here there were several days of prodromal symptoms, which, in 3 instances, resembled typhoid fever, and in 1 other, influenza. Most of the school children affected had retired in good health the night before they were stricken, only to become victims of the disease with alarming suddenness during the night.

In the adults, there was generally more warning, but the following 5 histories evince the opposite: (1) One of the early patients complained of a chill one morning on awakening, and early went to the drug store for some quinine. Nothing more was known about him at his boarding house until 3 A.M. the following morning, when some of the people in the house were aroused by a noise in his room. Without ascertaining the cause, a doctor was sent for, who found the patient lying on the floor of his room wildly delirious. He was taken to the hospital, but survived only a few minutes on reaching the ward. (2) Another man was apparently well the day previous and able to do his work. The next morning his landlady found him in a comatose state, breathing stertorously. (3) A sailor, employed on one of the Hartford boats, was taken ill with cramps in the abdomen while on this way up from New York. He rapidly became unconscious and died shortly after reaching the hospital. (4) A man was brought by the city ambulance to the hospital unconscious, half an hour before his death. He had been found in a cheap lodging house, where he had been in apparently good health the previous day. (5) A Dane, aged thirty-five years, woke up early one morning with a chill; he then had a high fever, with extreme nausea and a headache. He did not vomit, but from the extreme suddenness of the symptoms was immediately sent to the hospital, as his doctor thought that he had taken poison.

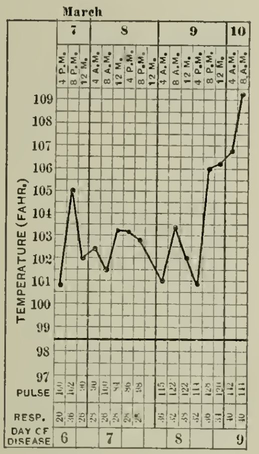
SYMPTOMS. The most constant symptom at onset was headache. It was noted in 27 cases and was very intense, being usually located in the occipital region. In 7 there was vomiting (6 of the 7 were children), in 6 a distinct chill, in 2 chilly feelings, in 1 weakness in the legs, in 1 weakness and sleepiness, in 1 pains in the abdomen, 2 were feverish and fretful, 2 were in a stupor when first seen, 1 had a pain in his foot, 1 an aching of the bones of the extremities, 1 tonsillitis, and 1 a fainting attack. Twenty-eight of the patients were conscious on admission, but 4 of them were in a state of semi-stupor; while 27 were unconscious, 10 of them being wildly delirious. Twenty-seven showed varying degrees of retraction of the neck, 3 presenting marked opisthotonos; in 11 there was some stiffness of the neck and sensitiveness to pressure over the cervical vertebræ. Twelve cases showed general as well as spinal hyperesthesia. Kernig's sign was present in 48 out of the 51 cases in which it was sought (82.27 per cent.). In 1 instance it was found in the left leg, but not in the right. The reflexes, unfortunately, were not tested in every case. The records of the knee-jerks show they were absent in 8, exaggerated in 4, diminished in 5, and normal in 7. A positive Babinski reflex was never obtained. In 5 cases muscle tremors were observed, and in 9 (7 children) convulsions occurred during the course of the disease. In 1 patient it was the initial symptom. In another three convulsions were noted nine months after the onset of the disease, and all of them during the administration of $\frac{1}{30}$ grain of strychnine every four hours. The strychnine was then discontinued, and no more convulsions were observed until about three days before death, when $\frac{1}{30}$ grain was given hypodermically, which again caused a slight convulsion and opisthotonos. Herpes was not a constant accompaniment, being noticed in 16 cases (29.09 per cent.). It was generally seen about the lips, but some cases showed extensive crops about the eyelids, cheeks, tongue, ear, neck, and back. An eruption was found on 43 of the patients (78.11 per cent.). It was a petechial rash in 28 instances, a pustular eruption in 1, in 1 a papular, in 4 purpuric spots were detected, in 5 rose spots, and 4 exhibited an erythema or a dusky mottling. The tongue was markedly coated in 20 patients. Vomiting, other than at the onset, was a constant symptom throughout the disease in 30 patients. Thirty-three were constipated during almost their entire illness, while in 11 diarrhœa was observed. Ten had retention of urine.

Cyanosis was a feature in 10 patients, in 1 of whom it was only noticeable just before death. Only 1 example of palpable spleen is recorded, although the area of splenic dulness seemed increased in 2 others. We are unable thoroughly to account for this small number. Possibly the inexperience of some of the internes in palpating but slightly enlarged spleens may partly explain it, for some of the patients died before the visiting physician saw them. The pupils were dilated in 29 cases, and contracted in 6 (later, they were dilated in 2 of these), unevenly dilated in 7, not dilated in 8, and not observed in 5. In 5 cases nystagmus was present, in 5 convergent strabismus, in 4 divergent strabismus; 4 had a bilateral ptosis, and 7 external strabismus. One had diplopia and another an ulcer of the cornea. In 8 cases there was a mild conjunctivitis. Ophthalmoscopic examinations were made on 5 patients; 3 were negative, while 1 showed optic nerve atrophy, with total blindness resulting, and the other a choroiditis. A suppurative or metastatic choroiditis of the right eye necessitated its enucleation in 1 case, in the ninth week. Nine cases had systolic murmurs over the cardiac area, which developed in 3 instances after admission to the hospital. The latter, with 2 other examples, were probably functional in origin. In 2 the murmur was due to a mitral insufficiency, and in 1 of them a fresh vegetation was found on the mitral valve at the autopsy. Unfortunately, no smear or culture was made from it. Arteriosclerosis seemed to account for the systolic murmur heard in a patient, aged sixty-four years. Arthritis was only once met with. It was seen in a woman, aged twenty-one years, on her admission to the hospital, and was accompanied by exudation. Its duration was about three weeks. One of the patients was a diabetic, as well as his father before him. Two vomited Ascaris lumbricoides during their illnesses. In one patient a peculiar fine branny desquamation on the face was seen during convalescence, sixteen days after the onset of the disease. Pneumonia was a complication seen six times; in 2 instances it was of the bronchial type. Death resulted in 4 of the 6. Seven patients had bronchitis during the course of the disease. In 1 paralysis of the left arm, and subsequently of the lower extremities, was seen a few days before death. Two showed on discharge a most marked mental impairment. Total deafness was the result in 2 cases. No other sequels were noticed.

Blood Examinations. Leukocyte counts were made of 48 patients, 45 of whom were in the acute stage of the disease. The average of these counts was 29,555. The highest, 70,000, was seen in a girl, aged five years. Thirty-four of them fell between 10,000 and 35,000. In 1 case 17 counts, and in 2 cases 15 counts, were made. These showed a gradual return of the leukocytes to normal as recovery ensued. It was not coincident, however, with the drop in temperature to normal. Following Draper's table, we give below the range in leukocyte counts: Under 5000, none; 6000 to 10,000, 4; 11,000 to 15,000, 4; 16,000 to 20,000, 9; 21,000 to 25,000, 4; 26,000 to 30,000, 9; 31,000 to 35,000, 8; 36,000 to 40,000, 4; 41,000 to 45,000, 1; 46,000 to 50,000, 1; 51,000 to 55,000, 2; 56,000 to 60,000, 1; 61,000 to 65,000, none; 66,000 to 70,000, 1.

Urine Examinations. Urine examinations were made on 42; the remaining patients came into the hospital practically moribund, and no urine was obtained for examination. In 28 out of the 42, albumin, with hyaline and granular casts, were found; 1 showed casts, but apparently no albumin, and 7 more showed the existence of albumin alone. In other words, all but 7 of the 42 cases showed albumin, and all but 13 showed casts. Five patients also revealed a trace of sugar, and another was a diabetic, whose urine contained 2.3 per cent. of sugar, with the additional presence of acetone and diacetic acid. During convalescence the casts and albumin cleared up in all the urines of the patients who recovered.

Types of Fever. Of the 55 cases we have temperature charts of 48. From a study of these we are thoroughly in accord with the statement made by former investigators that there is no typical temperature chart. In our series, although the fever does not seem to be proportional to the severity of the disease, yet we can resolve the cases into four groups, of which the first appears the most fatal: (1) The remittent fever type (Charts I, II, and III). In this class were 18 cases, and all but 2 of them were fatal. In 14 instances there was a rise of the temperature at death, the highest recorded being 109.4.° Most of those in this type (11 out of 18) died within the first six days of the disease. (2) The typhoid fever type (Charts IV and V). The cases here recorded showed a characteristic typhoid chart, with a fairly continuous temperature at first, then with more marked remissions in the later stages, and finally a return to normal, the duration of the disease varying from fourteen to four hundred and forty-six days. Twenty-two are placed here, of which number 11 died. (3) Pneumonic type (Chart VI), with the fever rising rapidly, and, when the fastigium is reached, remaining fairly constant until the temperature falls by lysis within a few days. Six charts are of this type. Only one death resulted in this group. (4) The ascending fever type. This was seen in only one patient, in whom the disease made rapid progress, being fatal on the second day. At death his temperature was 106.8° (Chart VII). The last patient was admitted during convalescence, with a normal temperature.



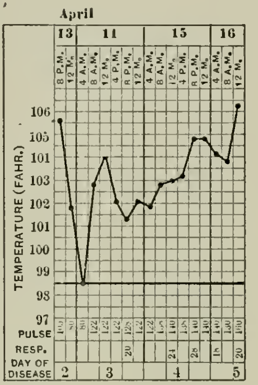


Chart I.—Remittent type of fever, with a high elevation at death (J. G., Case I).
Chart II.—Remittent type of fever, with a high elevation at death (L. C., Case III).

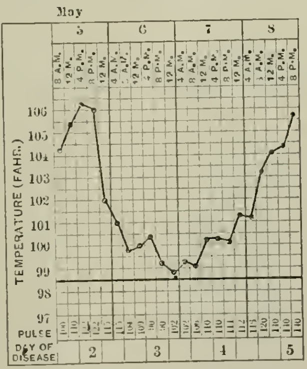


Chart III.—Remittent type of fever, with a high elevation at death (B. S., Case XIV).

Prognosis. The prognosis in no disease is illustrated more truly by the Hippocratic statement, that "experience is fallacious and judgment difficult," than in that of epidemic cerebrospinal men-

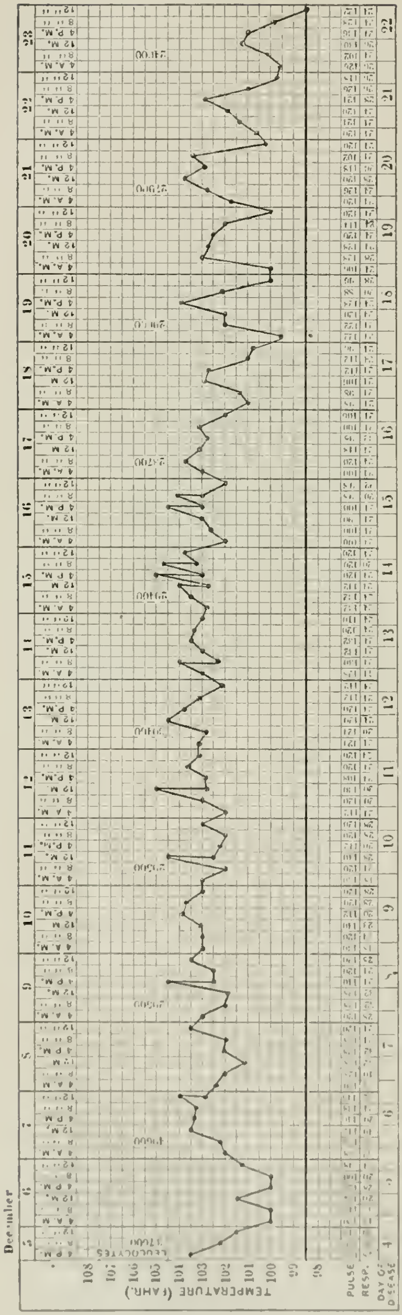


Chart IV.—Typhoid type of fever (J. F., Case XLIV).

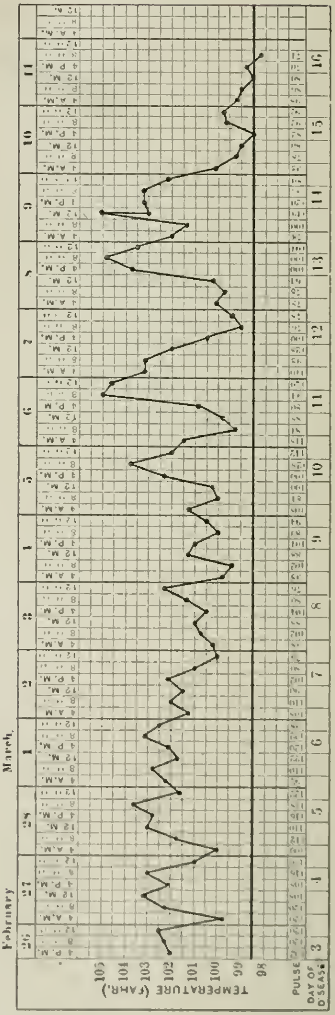


Chart V.—Typhoid type of fever (S. T., Case XLVI).

ingitis. Some of the sickest patients recovered (Figs. 1 and 2), while others, among those apparently least affected, rapidly succumbed. The mortality of the city cases was 74.48 per cent., while that of the hospital cases was 78.18 per cent. This is what we should expect, as the most severe examples of the malady are generally sent to a hospital. Indeed, a hospital's mortality in this affection is frequently higher. Of the hospital cases, 21 had an illness of less than six days, twelve hours being the shortest duration. The sojourn of the patients in the hospital varied from one day or less to four hundred and forty-six days. In 21 fatal cases death appeared to be due to the severe toxemia, while in 16 resulting exhaustion seemed to be the cause.

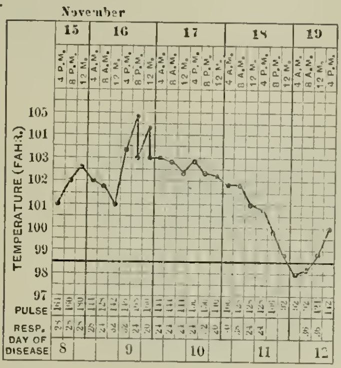


Chart VI.—Pneumonic type of fever (H. G., Case XLII).

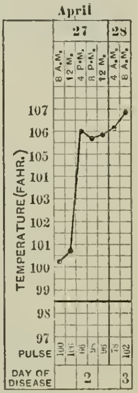


Chart VII.—Ascending type of fever (B. P., Case IX).

Diagnosis. The diagnosis of the cases seldom caused any difficulty after the nature of the epidemic was recognized. The first three cases were, consequently, only later differentiated, as above mentioned. They presented extreme delirium, but had few other symptoms. Three, from their onset, rose spots, and temperature charts, resembled typhoid fever, but their Widal reactions were continuously negative, and their affections were subsequently proved to be epidemic cerebrospinal meningitis. One patient had a headache and malaise for three days, and was thought to be ill with grip. Feeling better at the end of this period, the patient got up, but soon had to return to bed, on account of the sudden onset of a severe headache. In another case, with but few symptoms and no Kernig's sign, a lumbar puncture first revealed the diagnosis.

Treatment. In no affection do we feel our limitations as much as in this disease. The list of drugs used is not commensurate with their vaunted healing properties. Hot baths and hot packs seemed, as first stated by North, to lessen the delirium and quiet the pain more than cold applications. Lysol injections were given a brief trial and almost immediately given up, as we considered them an irrational procedure. Lumbar punctures in cases showing extreme headache, opisthotonos, and spinal hyperesthesia undoubtedly re-

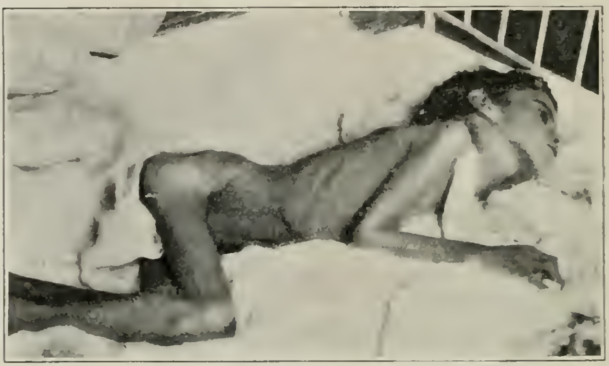


Fig. 1.—Case XXXVIII during the illness.

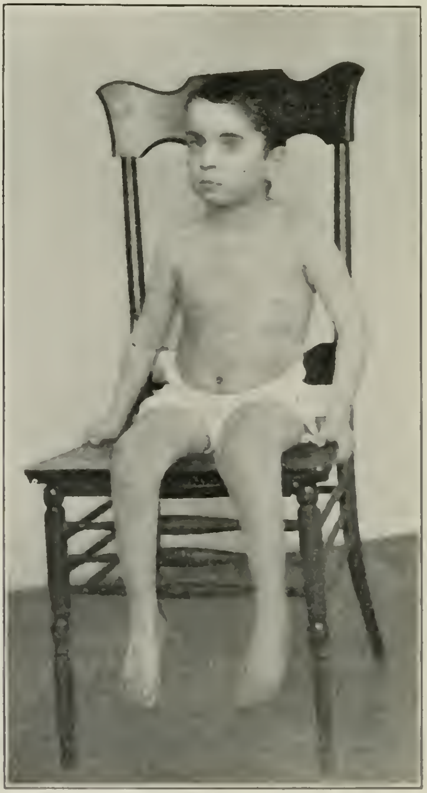


Fig. 2.—Case XXXVIII after recovery.

lieved these symptoms momentarily by reducing the pressure of the cerebrospinal fluid. Antitoxin was employed in 5 cases, and the antistreptococcus serum in another without any apparent benefit. The best sedative seemed to be opium in some form. The use of chloral, bromides, ergot, and potassium iodide yielded no satisfactory results. Resort was had to surgery in 1 case, in which two lateral flaps were made in the cranium, hoping by this method to establish free drainage, but the patient died two days later.

In conclusion, we desire to thank the visiting physicians to the Hartford Hospital, as well as their assistants, for their hearty cooperation. We are also indebted to Dr. E. A. Wells, then assistant visiting pathologist and bacteriologist, for much assistance; and finally, and not the least, we are under obligations of the hospital internes for many acts of service.

TUMORS OF THE CAUDA EQUINA AND LOWER VERTEBRÆ.

A REPORT OF NINE CASES: SEVEN WITH NECROPSY, THREE WITH OPERATION.[1]

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The symptoms of tumor of the cauda equina resemble closely those produced by certain other conditions. The diagnosis must be made between hysteria, multiple neuritis confined to the lower limbs, intrapelvic tumor, tumor or caries of the lumbar vertebræ or sacrum, lesions within the vertebral canal but external to the dura, tumor or other lesion (hemorrhage) of the conus, and tumor of the cauda equina.

Hysteria. One of the most important symptoms of tumor of the cauda equina is pain in the lower limbs, severe in type, usually appearing first in one limb and later in the other, and more commonly simulating sciatica. Pain in the lower limbs may be distinctly hysterical. I have recently observed two cases of this character in which organic lesions as causes of the pain probably did not exist. A differential diagnosis usually is possible after careful study, but in certain cases it may be very difficult. In addition to the pain, weakness of the lower limbs may occur in hysteria.

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[1] Read at the meeting of the American Neurological Association, May 7, 8, and 9, 1907.

MULTIPLE NEURITIS OF THE LOWER LIMBS. Neuritis is very seldom confined to both sciatic nerves and their branches, although it may be limited to the lower limbs, and I cannot agree with Müller[2] when he says that the upper limbs are almost invariably (fast regelmässig) implicated. I have seen neuritis confined to the lower limbs, but it is undoubtedly uncommon. Such neuritis does not usually cause great difficulty in diagnosis. The history of alcoholism or preceding infectious disease, or even when these factors are absent, the intense pain on pressure over the nerves and muscles, especially those of the calves, is very diagnostic, and there may be impairment of objective sensation and of motion; but pain on pressure over the limbs may occur in tumor of the cauda equina. The peroneal nerve supply is most likely to be affected in neuritis, but we recognize fully that isolated peroneal palsy occasionally occurs from intrapelvic lesions, and it is believed by some that the fibers forming the peroneal nerves are distinct from the other fibers in the sciatic nerve to their origin in the plexus of nerves in the pelvic cavity, and that they are more exposed to trauma within the pelvis than are the other fibers of the sciatic nerves. Bilateral peroneal palsy may occur from a lesion within the dura confined to the fifth lumbar and first sacral roots.

Bilateral sciatica is usually indicative of tumor. No diagnosis should be made with more caution than this of bilateral sciatica, and the condition is far too frequently regarded as merely ordinary sciatica in each limb. The prognosis should always be given with great reserve. Tumor of the pelvis, vertebræ, or cauda equina is often diagnosticated as sciatica which at first may be unilateral and later bilateral, and the condition in its commencement is the same as that of sciatica without disturbance of objective sensation and without motor paralysis.

Sciatica or multiple neuritis, even when the latter is in the lower limbs, is not usually associated with paralysis of the bladder and rectum, but the statement of Müller,[3] that this paralysis "noch nie beobachtet ist," is surely too strong. I should modify it by saying that it is very uncommon. I have seen multiple neuritis with implication of the bladder, and have a case under my care at present.

While tenderness of the muscles is usually indicative of peripheral neuritis, it has been observed in cases of tumor of the vertebræ and cauda equina, also in my cases II, IV, and V, and in the case reported by Sailer. In Schmoll's case of tumor of the cauda equina both sciatic nerves were exceedingly tender to touch. The condition is like the pain of meningitis. The posterior roots are greatly irritated, and any moderate peripheral stimulation is transmitted with unusual intensity. At least, this seems to me a reasonable explanation of the hyperesthesia of meningitis, and I do not regard the diagnosis of a complicating neuritis as necessary. We can hardly assume that peripheral neuritis occurs in every severe case of meningitis, as we must do if we attribute the pain of meningitis to neuritis, as hyperesthesia is so common in meningitis.

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[2] Deutsche Zeitschrift für Nervenheilkunde, 1899, xiv, 1.

[3] Loc. cit.

Neuritis of the lower limbs is often confined to the territory of certain nerves, although it may be general.

The diagnosis between neuritis confined to the lower limbs and tumor of the cauda equina may, in the early stages of the disease, be exceedingly difficult.

INTRAPELVIC TUMOR. A tumor of the pelvis may cause symptoms much like those of lesions of the cauda equina. The nerves forming the plexuses are more spread out in the pelvis than are the roots of the cauda equina, consequently an intrapelvic tumor may cause only unilateral symptoms, or at least symptoms confined to one side a long time, or preponderatingly unilateral, but the symptoms may be bilateral from the beginning if the tumor is medianly situated, or is multiple, or if the lesion is fracture. There may be the same pain and weakness either from tumor in the pelvis or in the cauda equina. Examination by the rectum or vagina is often useless in the early stages of intrapelvic tumor, as the new growth may be higher than the finger can reach, or may be too small or too flat to be detected. Later, when it has attained considerable size, it may be more easily palpated by the examining finger.

In a case seen by me in consultation with Dr. David Riesman, bilateral sciatica was for a long time the only symptom of intrapelvic tumor, and rectal examination was at first of no assistance in the diagnosis; later, the tumor grew to a large size and the diagnosis became easy.

The tenderness over the spine on pressure is not so likely to be present in intrapelvic tumor, but this tenderness has seemed to me rather an unreliable sign.

The motor and sensory symptoms usually occur more closely together in point of time in intrapelvic lesions than in caudal lesions, as in the pelvis both motor and sensory fibers are combined in the nerves, whereas in caudal lesions they are separate.

In pelvic lesions we expect symptoms indicative of implication of groups of fibers belonging to the lumbar and sacral plexuses, and not of one single nerve; still, we know that the peroneal nerve alone may be implicated in intrapelvic lesions. This is more likely to occur from trauma than from tumor.

In all the groups of cases under consideration the paralysis is flaccid, reaction of degeneration may be present, later atrophy may develop, and the tendon reflexes are diminished or lost, although it is possible to have some exaggeration of certain tendon reflexes when the nerves concerned in these reflexes are not implicated, and the neuritis is confined to other nerves even of the same limbs; or, in the early stage of neuritis, when the condition is one of irritation rather than degeneration.

In all these groups of cases the lesions implicate the peripheral segments (peripheral neurons), either the nerve fibers or nerve cells. When the lesion is above the lumbar region the clinical picture is a very different one.

The anesthesia of lesions below the cord proper (in the cauda equina, vertebræ, or pelvis) is not likely to be dissociated, as it may be in lesions within the spinal cord, but occasionally it is.

In plexus lesions, when the bladder and rectum are paralyzed, the power of erection and ejaculation is likewise usually impaired or lost, and yet a case of pelvic tumor reported by Müller[4] shows how difficult the diagnosis as regards these symptoms may be.

The pain was confined to the right lower limb one year. Three-quarters of a year after the beginning of the pain paralysis of the bladder and rectum appeared, and after the first year pain was felt in the left lower limb. The occurrence of vesical and rectal symptoms three-quarters of a year after the pain began Müller regards as contrary to the diagnosis of intravertebral lesion,and yet in one of my cases (Case II) of cauda equina tumor there can be little doubt that had the patient lived paralysis of the bladder and rectum would have occurred, even though it would have been months after the symptoms began. Much experience, Müller says, shows us that in lesions of the lower part of the vertebræ causing diminution of space the vesical and rectal nerves are first affected. This Case II of my series shows plainly that this statement is not always correct. Fibrillary tremors were present in Müller's case of intrapelvic tumor, and these are uncommon when the nerve cells are not involved. Although the bladder and rectum were paralyzed, erection was preserved, but ejaculation of semen was disturbed by paralysis of the ischiocavernosus and bulbocavernosus muscles. The fibers for erection, therefore, seem to rise higher in the cord and to leave the cord at a different level from those of the bladder and rectum, but the dissociation of these symptoms is certainly uncommon in lesions of the plexus. It is well to remember that it may occur, as demonstrated by this important case of Müller's.

Extremely interesting is a fact brought out by Müller, that the sensation of the lateral part of the scrotum is not from the coccygeal plexus, as is that of the median portion, but, like that of the testicles, is from the lumbar portion of the cord. Very little attention has been paid to this difference in origin of the fibers providing sensation to the lateral and median portions of the scrotum, but I have been able to confirm the correctness of the observation repeatedly.

Tumor of the Vertebræ. Here, as in all the tumors under consideration, pain is a very prominent symptom, and is likely to become bilateral sooner than in intrapelvic tumor. The posterior roots are caught in their passage through the intervertebral foramina, and the pain is usually constant, with exacerbations. Pressure over the lower vertebræ and sacrum may be exceedingly painful. It is impossible, in my experience, to decide from the symptoms whether the tumor is confined to the vertebræ or whether it extends also over the anterior surface of the dura. Of differential value in diagnosis from tumor of the cauda equina is the fact that the symptoms are likely at first to be confined to the distribution of a few nerve roots when the tumor begins in a vertebra, but that this is not always a reliable sign is shown by my Case II, in which the tumor was confined to the cauda equina, therefore was within the dura, and yet the symptoms indicated implication of only a few nerve roots. It is desirable to find some reliable means of clinical differentiation between tumor confined to the vertebræ and tumor on the dura or inside the dura without implication of the vertebræ. The former condition makes a radical operation impossible, although it does not forbid the attempt to cut posterior roots and relieve pain. A comparison of my Case II with Case IV is most instructive. In both pain was intense, with paralysis occurring after many months, and with no involvement of the bladder and rectum, and yet in the first the tumor was entirely within the dura, and in the other it was entirely extradural, and also in the verebræ.

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[4] Loc. cit.

Lesions of the Conus. The nerve tracts in the conus occupy a very small space, therefore when a lesion occurs in this part of the cord it is likely to implicate most of the tracts at nearly the same time. As a result paralysis of sensation and implication of the bladder and rectum occur almost simultaneously. If the lesions are strictly limited to the conus, which, following the lead of Raymond, may be recognized as beginning at the third sacral segment, we cannot expect motor paralysis except of the bladder and rectum, inasmuch as the limbs receive their motor supply from the lumbar and upper sacral segments. Pain is not usually a prominent symptom in conus lesions, unless the meninges or posterior roots are likewise affected.

Anesthesia in certain territories innervated by the lower sacral segments may occur in conus lesions and may be dissociated; it may even be bilateral from unilateral conus lesion, in that the buttocks near the anus, the perineum, and the external genitalia may be anesthetic on both sides. This bilateral anesthesia, so limited, is caused by involvement of the lowest posterior root fibers entering the conus on the side of the lesion and by involvement of the corresponding fibers from the opposite side after they have decussated in the conus.

When the lesion is confined to the conus it may by irritation of the adjoining upper region cause not only a zone of hyperesthesia above the anesthetic areas, but exaggeration of the patellar reflexes; yet this exaggeration of the patellar reflexes may occur from tumor of the cauda equina, as in Volhard's case.

Chronic meningitis confined to the lower part of the cord and cauda equina has often been described, according to Schultze, and such a lesion causes severe pain, atrophy, and paralysis, not unlike symptoms of tumor. Schultze[5] excluded meningitis in one of his cases (Case VI) because the symptoms were progressive and in sudden increases, and not affected by antisyphilitic treatment.

Müller[6] thinks that in conus lesions the degenerative atrophy occurs more rapidly and intensely than in cauda equina lesions, because in the latter the nerve fibers are not so completely and so quickly implicated. This is a reasonable supposition. I must agree with Müller when he takes issue with Valentine regarding his statement that there is no improvement in conus lesions. Müller reports spontaneous improvement in one of his cases of cauda equina lesions, and this surely may also occur occasionally in conus lesions. Improvement in cauda equina lesions after trauma is not uncommon. Indeed, Schultze[7] has shown that Valentine's statement is not correct for all cases, as in three of his own cases improvement did occur, but the improvement seems to have been in the regions innervated from the lumbar cord. It is very true, I think, that improvement of the function of the conus in conus lesions is usually unimportant, because the transverse area of any part of the conus is so small that lesion in this part of the cord is likely to destroy the conus in its entire diameter, but it is also true that improvement is usually slight in cauda equina lesions so far as the functions of the conus roots are concerned. Certain symptoms may disappear, but the residual palsy is likely to be persistent.

Another of Müller's cases is worthy of note because of certain unusual features. He believed the lesion to be traumatic myelitis of the conus. The bladder and rectum were completely paralyzed, and yet erection and ejaculation were possible (potentia coëundi et gerandi), as the patient became the father of two children after the accident.

I have had a similar case as the result of injury, possibly to the cauda equina, from muscular strain, although the lesions may have been in the conus:

H. C., a male, aged thirty-one years, was injured eighteen months previously by a bale of cotton falling against the abdomen. He was unable to work about three weeks, but then returned to heavy work, feeling not quite so well as formerly. About a month after returning to work, while lifting a bale of cotton, he felt something give way in the right inguinal region, and at the same time heard a tearing sound. He immediately felt weak, and limped on the right lower limb, but walked home, a distance of about two blocks, and went to bed. After one day he got out of bed, but remained at home about a week. He then returned to heavy work, but has not been quite so strong as he was before the injury.

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[5] Mitteilungen aus den Grenzgebieten der Medizin und Chirurgie, 1903, xii, 163.

[6] Loc. cit.

[7] Deutsche Zeitschrift für Nervenheilkunde, 1894, v, 247.

After the accident he lost control of the bladder, so that when he coughed or exerted himself urine would flow. The condition gradually became worse, until now he has no control of his bladder, and has been wearing a bag about a year. The sexual desire is not weakened, but he refrains from the sexual act because of the dribbling of the urine. He had sexual intercourse successfully six months ago without impairment of ejaculation and erection. During the past two months he has noticed that the rectal sphincter functionates weakly, and that when there is a call to stool it is urgent.

Present Condition. His gait and station are good. The lower limbs are well developed, but the man thinks he is weaker than he was before the accident. The left side of the scrotum, left side of the perineum, and the left buttock near the anus have fully normal sensation to touch and pinprick;[8] whereas the right side of the scrotum, except the upper outer portion, the right buttock, in a small area near the anus, and, to a less degree, the right side of the perineum, show diminution of sensation to touch and pinprick. The right side of the penis is less sensitive to touch and pinprick than the left side. He has no control of the bladder, but can control his bowels, except when they are loose. The sensation of the testicles is normal. The patellar reflexes are prompt. The Achilles reflexes are absent or slight. Babinski's sign is not present. The upper portion of the body is not affected.

Müller refers to a case similar to his own reported by Rosenthal, and also to a case reported by Bernhardt in which the bladder and rectum were paralyzed, although the sexual powers were preserved, except that the muscles for expelling the semen (the ischiocavernosus and bulbocavernosus) were paralyzed, that is, the condition, as Müller puts it, was potentia and libido coëundi with impotentia generandi, and he refers to a case reported by Schiff in which ischuria paradoxa and paralysis of the sphincter ani existed, but power of erection was retained. The loss of function of the bladder and rectum, with preservation of erection and ejaculation, is in favor of a conus lesion, but in my case the lesion probably was in the cauda equina, as the symptoms indicated probably unilateral injury, although a lesion of the conus cannot be excluded.

The conus may be injured, while the surrounding roots escape, as in the cases reported by Oppenheim, Schultze, and Sarbó.

Müller says he was unable to find any cases, with necropsy, of conus lesions without trauma.

Van Gehuchten,[9] from a study of the literature and of a case of lesion of the cauda equina and experimental work, believes that the bladder, rectum, and genital organs may retain their functions to a certain degree even when all the roots of the cauda equina, beginning with the fifth lumbar, are affected. He believes in the existence of a reflex centre for micturition, defecation, and erection outside the cord, but not for complete ejaculation of the semen. The restoration of micturition, defecation, and erection after trauma does not indicate that the conus is intact. The primary centres for these functions are in the hypogastric plexus of the sympathetic system; only the preservation of the anal reflex and of ejaculation indicates anatomical integrity of the conus and its roots. While primary centres for the functions mentioned are in the sympathetic system, other centres for them are in the conus, and are necessary for normal discharge of these functions.

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[8] A year later disturbance of sensation has been noticed on this side.

[9] Le Névraxe, 1903, iv.

I have had the opportunity to study a case of lesion of the cauda equina which bears out these statements. The disturbance of sensation is in the lowest sacral roots. By passing the urine and feces every three or four hours the man exerts a certain control over the bladder and rectum. The discharge is started by voluntary pressure of the abdominal muscles, but the man has no sensation from the flow of the urine, as the urethra is anesthetic. When the urine has nearly ceased to flow he is unable to stop the stream or to expel the last few drops. Erection occurs. There is, therefore, a certain periodicity in this case, but in another under my observation, in which sensory disturbances are also limited to the lower sacral roots, both cases resulting from injury to the end of the spinal column, the urine dribbles without the slightest control by the patient.

Warrington refers to the fact that Raymond has shown that a spinal lesion may cause incontinence of urine without any anesthesia, and Van Gehuchten, that in damage to the conus complete control over the sphincters may be preserved with the urine voided in a nearly natural manner while the mucous membrane of the urethra and bladder are absolutely anesthetic. Erection of the penis was preserved in Van Gehuchten's case, and this, Warrington thinks, is difficult to explain, inasmuch as the penis was absolutely anesthetic, and presumably the sacral centre had been completely destroyed. As he believes the preservation of control over the sphincters may have been due to the activity of the lumbar centre through its fibers to the sympathetic, it should not be difficult to explain the erection in the same way, as this is not always dependent on the sensation of the organ. Ejaculation of semen and forcible expulsion of the last few drops of urine depend on the contraction of the bulbocavernosus and ischiocavernosus muscles, and are always paralyzed if the lowest sacral part of the cord or the corresponding roots are damaged, according to Warrington. It would seem, from Warrington's statements, that these functions are not disturbed by a lesion of the lumbar centre. He refers to Van Gehuchten's statement that it is only with unimpaired capacity for these actions and in the persistence of the anal reflex that the diagnosis of integrity of the conus medullaris and of the corresponding roots can be made. The following points, as Warrington[10] concludes from the writings of Raymond and Sippy, are in favor of a lesion of the cauda equina in distinction from one of the conus.

1. An insidious onset, with general development and progression of symptoms. A lesion in the conus is likely to cause a more rapid development of the symptoms.

2. Pain, violent in nature, spontaneous or excited by change of position or by movement, is in favor of root lesion, though moderate pain may be present in either condition.

3. Pain over the vertebral column below the level of the second lumbar spine exaggerated by percussion and radiating toward the lower limbs speaks for a root lesion. Warrington adds to this rigidity of the lower part of the spine from irritation of the nerves of the dura. Pain higher up, increased by pressure and not radiating very clearly over the lower limbs, is in favor of a medullary lesion. Lasègue's sign is indicative of a root lesion. Asymmetrical development is a radicular symptom, and is, perhaps, especially suggestive of an extradural lesion. My Case II shows, however, that one may be readily deceived in this sign. Remission of symptoms, especially amelioration in the condition of the bladder and rectum, and the slow appearance of muscular wasting, of the reaction of degeneration, and of trophic disturbance are, according to Warrington, in favor of an affection of the cauda equina.

TUMOR OF THE CAUDA EQUINA. The pain in cases of this type is often unilateral at first, but, as a rule, soon becomes bilateral, and yet it may remain unilateral many months. If the tumor develops at the lower end of the cauda equina, it will implicate the nerve fibers supplying the bladder and rectum, causing disturbance of function in these viscera, and disturbance in sensation in the region of the anus from the implication of the lowest sacral and coccygeal roots. This symptom-complex does not necessarily imply that the tumor is so low, because a new growth within the filum terminale near its origin from the cord may press at first upon those roots nearest to the filum, that is, the coccygeal and lower sacral, and cause the same combination of symptoms as when the tumor is considerably lower. This was well shown in the cases of Lachmann and Volhard.

In Lachmann's case of glioma of the upper part of the filum terminale the diagnosis of carcinoma of the bladder was made. The symptoms had existed two years, and began with incontinence of urine, paradoxical ischuria, and retention of feces. Later, digestive disturbances and emaciation developed. Hemorrhage into the bladder, especially with sudden return of the power to empty the bladder, strengthened the diagnosis of carcinoma, as in papilloma of the bladder catheterization by removal of the occlusion of the orifice may cause hemorrhage and return of the power to empty the bladder. The necropsy revealed catarrh of the bladder, with swelling and injection of its mucous membrane.

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[10] Lancet, 1905, II, 749.

A case of Cruveilhier, reported in his atlas, to which Lachmann[11] refers, shows, however, that a tumor of the filum does not always cause symptoms confined to the bladder and rectum. The symptoms were paralysis of the lower extremities, with contracture, and paralysis of the bladder and rectum. A tumor, which Lachmann thought the picture showed to be in the filum, was found. It was diagnosed as "encéphaloide."

A tumor of the filum, however, may exist without causing symptoms if it is not very large. I[12] reported a lipoma of the filum without any symptom caused by the growth, as the tumor had not attained a size sufficient to cause pressure.

Volhard's case is an exceedingly interesting one. The symptoms developed slowly (during four years), and began with disturbance in emptying the bladder and in sexual power, then dilatation of the bladder occurred with pyelitis, and dyspeptic symptoms, dryness of the skin and mucous membranes, and constipation. The muscular supply of the left sciatic nerve later became weak, and slight hypesthesia was detected in this region. The patellar reflexes were lively and the cremasteric reflex was present on both sides. The Achilles tendon reflex was weak on the left side and absent on the right side. Pain was not felt, and the only subjective sensory disturbance was a feeling of pressure over the sacrum. The absence of pain in this case, in which the symptoms persisted four years, was most extraordinary, and no similar case of cauda compression was known to Volhard, nor have I been able to find any, although tumor elsewhere on the spinal cord without pain has been observed. Operation was not attempted, as the patient's condition became too grave. The necropsy revealed a benign tumor of the cauda equina close to the conus, pressing the roots forward, and thereby injuring the motor roots most, as they were pressed against the bone, whereas the posterior roots were next to the soft tumor. A tumor lower in the cauda, Volhard[13] thought, could not have caused the symptom-complex. The weakness of the left lower limb seems to have been present about two years or a little more, and yet in all this time the right lower limb did not become weak; but a still slower development of the symptoms was present in a case of tumor of the cauda equina observed by Schultze.[14]

In this case pain was felt in the distribution of both sciatic nerves in 1885, and paralysis in the distribution of the right peroneal nerve in the end of 1886, but paralysis in the distribution of the left peroneal nerve did not occur until 1891, five years later. Vesical symptoms did not appear until seven years after the beginning of pain. Operation was attempted and a part of the tumor was removed, but the bleeding was profuse, much cerebrospinal fluid escaped, and the patient died on the eleventh day after the operation. The necropsy showed a large tumor of the cauda equina, an angiosarcoma myxomatodes, that had eaten its way through the bone.

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[11] Archiv für Psychiatrie, xiii, 50.

[12] Journal of Nervous and Mental Disease, 1899, p. 287.

[13] Deutsche med. Wochenschrift, August 14, 1902, Nr. 33, p. 591.

[14] Mitteilungen aus den Grenzgebieten der Medizin und Chirurgie, 1903, xii, 163.

A tumor may implicate both posterior and anterior roots, and for a long time cause only pain, usually in the hips, over the coccyx, and in the distribution of the sciatic nerve. The growth may be quite large, but it will still find space without causing a paralyzing pressure upon the nerve roots. A moderate degree of pressure is, however, sufficient to irritate the nerve roots, and this irritation will usually be shown first in the posterior roots, and therefore as pain, but there may be spasmodic twitching of the muscles of the lower limbs. The paralyses of motion and of sensation are usually later symptoms, and indicate that the tumor has attained considerable size. The paralysis may develop rapidly or within a few days, and in one of my cases of rapid paralysis (Case II) a blood cyst was found at necropsy. This cyst, with its well defined wall, could not have formed within so short a period before death, a few weeks. It is probable that a cyst existed in association with the tumor, and that hemorrhage into the former occurred.

Usually the development of symptoms in cauda equina lesions is very gradual, the symptoms beginning with pain and loss of reflexes in the lower limbs, followed often much later by paralysis and atrophy and anesthesia. The anesthesia is to be sought for especially in the perineum, external genitalia, and in a narrow zone about the anus, as this region receives its sensory nerves from the lowest roots of the cauda; and, although the tumor may not be at the exit of these roots through the sacrum and coccyx, it may exert pressure upon them near their exit from the cord, notwithstanding they are centrally situated in the cauda equina; but it is not true that these centrally situated roots are always first affected, as shown by my Case II, although Müller says it has been demonstrated that in high lesions of the cauda equina the most central nerve roots, those that arise lowest from the cauda, that is, the roots innervating the bladder and rectum, usually are first affected, and he refers to Lachmann in support of this statement; but this combination of symptoms by no means invariably occurs in high lesions of the cauda equina. In Lachmann's case the tumor was in the filum, and therefore in immediate relation with the lower sacral and coccygeal roots.

In determining the level for operation, the highest roots giving evidence of implication should be exposed.

A very interesting case of cauda equina lesion, reported by Müller,[15] shows how difficult the diagnosis between cauda equina and conus lesions may be:

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[15] Loc. cit.

A man, aged twenty-two years, after carrying heavy weights, had severe pain in the lumbar region lasting two days. He then worked fourteen days, when the lumbar pains returned, were severe, and soon radiated into the lower limbs. These limbs, as well as the muscles of the trunk, rapidly became weak; the right lower limb, however, did not become weak until a few days after the left lower limb had become completely paralyzed. Then followed paralysis of the bladder and rectum. Weakness was present in the legs below the knees, but the feet were completely paralyzed. Reaction of degeneration was obtained in the back of the thighs, and in the legs below the knees, and ataxia in the heel-to-knee test was seen. Sensation was greatly affected in the distribution of the sacral roots. The patellar tendon reflexes and Achilles tendon reflexes, erection and ejaculation were lost. The pain indicated a cauda equina lesion, but the rapidity in the development of the symptoms, early cessation of pain, and the complete paralysis of the affected muscles indicated a conus lesion. Dissociation of sensation was imperfect over the scrotum and penis (impaired tactile sensation, loss of pain and temperature sensations), and bedsores developed rapidly; all this made the diagnosis of myelitis probable, but the cord was found to be normal, while the cauda equina was the seat of inflammation. This interesting case shows that at least an imperfect dissociation of sensation may occur in lesions of the cauda equina. Müller was unable to find any case in the literature like this one of his.

One reason why tumor of the cauda equina is likely to cause first sensory symptoms is that at the lower end of the cord the sensory roots are more numerous and larger than the motor roots, as shown by Müller.

When trauma is the cause of cauda equina lesions the symptoms may develop rapidly, as a fracture may implicate many nerve roots.

In the case reported by Laquer[16] pain, sharply localized to the middle of the sacrum, had persisted two years with pain on pressure in the same region. The rectus femoris muscle on both sides was weak and slightly atrophied. There had been transitory vesical and rectal paralysis. The tendon reflexes of the lower limbs were diminished. The sexual functions were impaired. Lumbar kyphosis was present. On account of the great pain by pressure over the sacrum the diagnosis of tumor was made, not within the dural sac, but outside the dura or within the sacrum. Every symptom of bone disease, swelling, displacement of the sacrum, was absent, and disease of the pelvis was considered improbable; therefore the conclusion was reached that the tumor was within the sacral canal. An intradural tumor implicating the cauda equina was considered improbable, as extensive motor, sensory, and trophic disturbances were absent notwithstanding the long duration of the process, and

[16] Neurologisches Centralblatt, 1891, p. 193.

the vesical and rectal paresis was of short duration, except that slight ischuria remained. This case, however, clinically has great resemblance to my Case II, in which the tumor was within the dura.

The entire sacral canal was opened, and a tumor (lymphangioma cavernosum) was removed from about the middle of the sacrum. It was about the size of the little finger, extradural, and not united with the roots or dura, but pressing the dura and cauda equina forward. The pain had disappeared two weeks after the operation, and the patient left the hospital cured four weeks after the operation. The dura was not opened, and possibly the recovery was due to this fact. The case seems to have been a most successful one.

In Laquer's case the pain in the sacrum was intensified by coughing, sneezing, defecation, or by the dorsal position. The absence of pain on pressure over the sciatic and crural nerves was one of the points used in favor of the diagnosis of a tumor beneath the sacrum, but some of my cases show that this pain on pressure over the nerves may be present in cauda equina or vertebral tumors.

A very thorough report of a tumor upon the conus and infiltrating the cauda equina is given by Sailer.[17] A man had severe pain in his lower limbs for some time. His gait had been ataxic six months. The pain commenced in the feet, and in this the case is remarkable, and extended upward, and was more severe in the left lower limb. Diffuse tenderness was present in the lower limbs, and especially over the nerve trunks. The sciatic nerve was more sensitive than the others. Continuous pain and tenderness were felt in the lumbar region. The feet were œdematous. (This condition in Schmoll's case caused him to suspect involvement of the vessels, but exploration of the abdomen did not reveal any vascular obstruction.) Paresthesia was present in the lower limbs, but objective sensation was probably not impaired. The patellar reflexes were absent. The man was able to move his lower limbs, but they were wasted. Later, frequent micturition appeared. A melanotic sarcoma was found in the lumbar region at the necropsy, about one inch in diameter, lying upon the left side of the lumbar enlargement and cauda equina roots. The tumor extended downward to the conus. Its total length was 4 cm., its anteroposterior diameter 1 cm., and its lateral diameter 7 cm. in the widest part. A considerable mass of granular tissue infiltrated the cauda equina. Sailer discusses the rarity of this variety of tumor within the vertebral canal. The spinal cord in the region of the tumor was much enlarged.

In the case of tumor of the cauda equina studied by Schmoll[18] both sciatic nerves were excessively tender. The nerves became so tender that the patient could not lie on the back or abdomen, and to obtain relief was obliged to rest in a kneeling position. In order to sleep he knelt on cushions and reposed his head on the bed. He had rectal crises, with extremely painful tenesmus.

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[17] Contributions from the William Pepper Laboratory of Clinical Medicine, vol. i, p. 129.

[18] AMER. JOUR. MED. SCI., 1906, cxxxi, 133.

The bilateral sciatica was of three and one-half years' duration, and the rectum was involved in the painful area without involvement of the bladder. During this period the symptoms had not increased, and were merely those of pain. This is a most extraordinary case in this respect, and affords a remarkable contrast to Volhard's case, also of long duration, in which pain was not felt. It resembles my Cases II and IV. It is not strange that Schmoll could not believe that the lesion was a tumor, and, as the man had pulmonary tuberculosis, he concluded that a slowly progressing inflammation of tuberculous nature was involving the nerves. An "intraspinal" gliosarcoma was found beneath the sacrum, banana-like in form, about 6 cm. long and 2 cm. wide. The statement is made that it was "beneath the dura mater, which formed the floor of the opening;" therefore, it was a tumor of the cauda equina. The patient died on the fourth day after the operation with meningitis and pneumonia.

Schmoll thinks that the interval in his case between the beginning of irritation of the posterior roots and of other signs of compression is the longest on record. The cauda equina at necropsy showed no signs of the longstanding compression. Motor symptoms appear to have been entirely absent, but they did not develop until after many months in my Cases II and IV.

In Valentine's[19] case a prominence was observed over the third to the fifth lumbar vertebræ. A small piece of tissue removed showed the tumor to be a small round cell sarcoma, but neither operation nor necropsy permitted a confirmation of the diagnosis. The two cases of tumor of the cauda equina reported by Sibelius[20] are interesting chiefly from a pathological standpoint.

Schlessinger,[21] in his work on tumors of the spinal cord, gives pictures of a glioma of the conus terminalis (p. 26) at the junction with the filum; of a small cell sarcoma attached to the nerve roots and reaching nearly to the cauda (p. 34); and of an endothelioma of the dura lying upon the cord, reaching to the beginning of the cauda equina, and apparently well defined (p. 39).

The preservation of the sexual functions, even when the sensation of the bladder and urethra is lost, is shown in a case reported by Valentini,[22] in which paralysis of the bladder, with ischuria paradoxa and anesthesia of the penis existed, but the sexual functions were almost intact, except that the ejaculation of the semen into the anesthetic urethra was not noted. Valentini concludes that the nerves controlling the sexual functions must be distinct from the sensory and motor nerves of the bladder and urethra, and other cases referred to in this paper fully justify this opinion,

[19] Zeitschrift für klin. Med., 1893, p. 246.

[20] Homén's Arbeiten, Band i, Heft 1, 2.

[21] Beiträge zur Klinik der Ruchenmarks- und Wirbeltumoren, 1898.

[22] Zeitschrift fur klin. Med., 1893, xxii, 245.

In Thorborn's[23] case, with symptoms of extensive lesion of the cauda equina, only a very small tumor, a fibrosarcoma about the size of a hempseed, was found on one of the nerve roots of the cauda equina, with no signs of diffuse inflammation. As Thorburn says, some other lesion must have existed. Operation was not attempted.

In a case of tumor of the cauda equina reported very briefly by Gowers,[24] operation was not attempted. Many nerve roots were involved in the tumor, which was a fibrosarcoma, and from the picture given by Gowers, it could hardly have been removed by operation.

As regards the level of the lesion, the important case of Schultze[25] must be borne in mind. He has shown that a fracture of the twelfth thoracic and first lumbar vertebræ, causing a spicule of bone to project into the vertebral canal in the median line, and thus involving the lower part of the lumbar swelling of the cord, may give a symptom-complex confined to the distribution of the sciatic nerves and lower roots of the cord, providing the upper lumbar roots, situated laterally at this level, are not implicated. In such a case Erb had made a diagnosis of lesion of the cauda equina not higher than the fifth lumbar vertebræ. A lesion, therefore, at the level of the first lumbar vertebra, if it injures the cord alone, may allow the function of the lumbar roots, except, perhaps, of the fifth lumbar, to be preserved; and cause the same symptoms as a lesion of the fifth lumbar vertebra; while a complete transverse lesion, as a tumor, at the level of the second lumbar vertebra, may implicate all the lumbar roots, as well as the sacral, and cause complete motor and sensory paralysis of all the nerve distributions of the lower limbs.

Surgical Intervention. The question of operation is an exceedingly important one in cases of tumor of the cauda equina. Laquer's case is the only one Volhard could find in 1902 of cauda equina tumor correctly diagnosed and successfully operated upon. He found only six cases of tumor high in the cauda equina, and in those the correct clinical diagnosis was not made.

In Laquer's case the tumor was on the outside of the dura, and the latter was not opened. It is not improbable that the success of the operation depended upon this fact. Selberg[26] reports (1904) a case of spina bifida, complicated by a lipoma, implicating both spinal cord and cauda equina. The tumor was removed. Recovery from the operation occurred.

In another case a sarcoma was found at operation compressing the cord and cauda equina. The opening in the vertebral canal was 14 cm. long. The portion of tumor removed measured almost 9 cm.; it was, therefore, a very large tumor. Hemorrhage during the operation was slight, but the pulse was feeble after the operation —84, and death occurred the same day in collapse. The symptoms were not proportionate to the size of the tumor.

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[23] Brain, vol. x, p. 388.

[24] A Manual of Diseases of the Nervous System, second edition, 1892, vol. i, p. 546.

[25] Deutsche Zeitschrift für Nervenheilkunde, 1894, vol. v, p. 247.

[26] Beiträge zur klin. Chirurgie, 1904, vol. xliii, p. 197.

It is evident that the most thorough asepsis must be maintained in operations upon the spinal cord, especially in the lower portion, and this often is difficult, as decubitus and eczema occur, especially over the sacrum, making the opening of the lower part of the spinal canal especially dangerous. The escape of cerebrospinal fluid probably is considerable in the first few days after the operation. Selberg suggests that the patient, after the operation, should be kept with the upper part of his body slightly raised, in order to lessen the danger of pneumonia, and he should lie on one side to prevent the urine running into the bandages. The abdominal position during the operation increases the danger of pneumonia. If this be true, it would be possible to operate while the patient is lying on his side. Selberg says we must acknowledge that only a small portion of spinal tumors are operable, on account of their character and position. The operable tumors are those of the membranes that have not implicated the cord, and are lipomas, fibromas, psammomas, echinococci, and exostoses.

In Sachs' 2 cases,[27] reported in 1899, operation was performed. In the first a tumor (alveolar sarcoma) the size of a small cherry was found adherent to the dura and bone, and compressing the cauda equina. As much as possible of the diseased tissue was removed. In the second case laminectomy of the second and third lumbar vertebræ was performed. A gelatinous mass (small cell sarcoma) was exposed invading the body of the third lumbar vertebra. The tumor was removed. It had compressed the cauda equina. Improvement was pronounced in both these cases, but in neither was the dura opened.

In Starr's[28] case the spines and arches of the second, third, and fourth lumbar vertebræ were removed. An endothelioma involving both the soft and hard tissues was found. The dura seems to have been left unopened. The patient was in a critical condition for two days after the operation, but later improved. The case was reported shortly after the operation.

In the case of tumor of the cauda equina, reported very briefly by Fraenkel,[29] operation was performed, and the patient reacted with difficulty. The tumor was a fibrosarcoma. "Certain symptoms improved after the operation." Death occurred two months later.

The case of tumor on the cauda equina and lower part of the spinal cord reported by Putnam and Elliott[30] has some features of unusual interest. The patient, a woman, had been operated upon for cancer of the breast, and the diagnosis was metastasis to the spinal cord. Removal of the spinal tumor was attempted. An incision ten inches long was made over the lower thoracic and upper lumbar region, and the laminæ of the last thoracic and first two lumbar vertebræ were removed. On opening the canal, a carcinoma was found immediately beneath the bone. It was removed as far as possible, and two nerve roots on each side at the level of the growth were divided outside the dura but within the spinal canal. The dura was not opened. Relief of pain from this operation was very marked, but death occurred after a few months. The authors had entertained the thought of dividing the spinal cord in order to relieve the pain.

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[27] Journal of Nervous and Mental Disease, 1900, p. 108.

[28] Ibid., 1901, p. 156.

[29] Ibid., 1903, p. 101.

[30] Ibid., p. 670.

In the case of tumor reported by Box,[31] the first, second, and third lumbar spines and arches were removed. The dura was red, pulpy, and thickened. The cord appeared to be normal when the dura was opened, but no tumor was found. A piece of dura examined microscopically showed inflammatory changes, with small areas of calcification. The operation was well borne and the wound healed well. Later, a prominence appeared in the neighborhood of the laminectomy scar. A necropsy was not obtained. The tumor was supposed to have arisen in the meninges or the vertebræ, and thereby to have caused root symptoms, which were bilateral from the beginning.

Warrington's[32] interesting case of tumor of the cauda equina was typical in its symptomatology. Operation was performed and a soft-looking tumor was found within the cauda equina. It bled very freely when the attempt was made to remove it, and only a part could be obtained. The tumor was an endothelioma, or hemorrhagic angiosarcoma. Improvement occurred, but symptoms began to return about the end of three months. When a second operation was attempted the tumor was found to have grown enormously and was two to three inches long. A number of posterior roots were divided. The patient made a good surgical recovery after each operation, although in each the dura was opened. The first operation was on September 2, the second about three months later, and death occurred in the following May. At the necropsy the original growth was found to be of very large size, and multiple growths were present in the pia along the whole length of the spinal cord. A similar growth was present in the angle formed by the cerebellum, pons, and medulla oblongata.

The pain in this case is worthy of special notice; it was increased by flexing the thigh on the pelvis (Lasègue's sign), but distinct pain on pressure was not felt over the muscles of the thighs or legs or at the points of Valleix.

Warrington, on referring to the literature on tumors of the cauda equina, says Dufour (1896) collected 21 cases; in only 1 had an operation been performed, and this was successful (Laquer's case, to which I have already referred). At a meeting of the Neurological Society, on October 27, 1904, Warrington says Dr. Ferrier and Sir Victor Horsley showed a patient from whom a fibromyxoma compressing the conus and cauda equina had been removed with marked success.

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[31] Lancet, 1903, II, 1566.

[32] Ibid., 1905, II, 749.

In one of the recent cases of spinal tumor reported by Batten[33] a sarcoma was found at operation outside the dura extending along the left twelfth posterior thoracic root. It was removed. The dura evidently was not opened. The condition of the patient following the operation is not stated.

This review of the literature shows that operations on the lower part of the vertebral column for tumor have been rather discouraging. True, the number of operated cases is small. I leave out of consideration here the successfully operated case of spina bifida, complicated by lipoma, reported by Selberg, and others of this character are known. The conditions in spina bifida are not the same as in tumor of the cauda equina.

Death occurred following operation in the cases of Selberg, Schmoll, Schultze, and cases of my series, I, II, and IV, although in the latter the tumor was extradural. Operation was not attempted in the cases of Cruveilhier, Volhard, Valentini, Sailer, and of my Cases III, V, VI, and VII. It was of benefit in the cases of Sachs, Starr, Fraenkel, Putnam and Elliott, Ferrier and Horsley, and Warrington; but Warrington's seems to be the only case in which the attempt to remove a tumor of the cauda equina did not result fatally, and the amount of improvement in this case is questionable. Opening the dura where a tumor of the cauda equina exists seems to be a serious undertaking.

We should like to accept the opinion of Müller when, in discussing tumors, he says that the prognosis from surgical intervention on the sacrum and lumbar vertebræ is decidedly better than on the other vertebræ and cranium, but statistics are not yet sufficiently large to warrant this statement. In my own cases, when the tumors could be examined they were all of such a character that complete removal would have been impossible, and this seems to have been true of most, if not of all, recorded cases. The well-defined, almond-shaped fibromas or fibrosarcomas occurring frequently at higher levels of the cord are much less likely to develop in the region of the cauda equina. Volhard regarded the tumor in his case as a glioma, although it was external to the cord, but intradural. He expressed the opinion that the tumors of this region that have been described under various names are all of the same character, and possibly are congenital; but, so far as I can judge from my own experience, they are usually sarcomas, and very often infiltrate about the roots of the cauda equina, or implicate the surrounding bone. The tumor in my Case II was a fibrosarcoma, but not like the sharply defined tumor of this character often found at higher levels of the cord.

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[33] Lancet, 1907, I, 139.

If the prognosis at present is very gloomy, in operating for tumor at the lower part of the vertebral column, it may be possible at least to cut posterior roots in order to relieve pain. It is not easy to determine the individual roots presenting in the opening formed by the exposure of three vertebræ. When the dura is incised the roots appear in contact with one another and they cannot be traced except in a very imperfect manner to their point of origin in the cord, or to their point of exit through the dura. The uppermost roots presenting in the opening are, of course, the sensory, and by observing whether the roots pass toward the posterior or the anterior part of the cord it may be possible to determine whether they are sensory or motor. If the attempt is made to divide all the sensory fibers of any one root, it is probable that some motor fibers will be included and may be cut, but it is doubtless unnecessary to cut every sensory fiber of any one root in order to relieve pain.

The roots of the cauda equina descend far within the dural sac, but on leaving the dura they pass only a little way downward before entering the intravertebral foramina; the sacral roots, however, have a longer extradural course than the lumbar. Having determined the lumbar vertebræ, each root at the lower border of a lumbar vertebra has the same name as the vertebra immediately above it, and we may, therefore, recognize it, and by tracing its course into the dural canal the sensory fibers may be separated from the motor.

If the opening in the vertebræ is high enough to permit exposure of the end of the conus, the second lumbar root may be determined by finding the first root leaving the dura below the conus; in the adult this is the second lumbar root.

The sensory roots supplying the bladder and rectum are at the interior of the cauda equina, near the conus, and it may be possible to leave these uncut. In cases in which the bladder and rectum are not paralyzed great care should be taken in cutting posterior roots to avoid the roots to the bladder and rectum, as paralysis of these important organs is a most undesirable complication. A few cases in the literature in which the posterior roots of the cauda equina have been cut to relieve the pain of tumor are referred to in this paper. It is permissible only when the tumor is irremovable and the pain is intense.

ORIGINAL OBSERVATIONS.

Case I.—The first case of tumor of the cauda equina which I have studied was in the service of Dr. Dejerine, at the Salpêtrière.[34] This case was reported in 1895 by Dr. Dejerine and myself, more, however, as an anatomical and pathological study. The tumor was a round cell sarcoma. The patient had had pain and paralysis in her lower limbs eighteen months, implicating chiefly the right side. The operation was performed by Chipault. The third, fourth, and fifth lumbar and first sacral vertebræ were operated upon, and the tumor was found within the dural sac implicating the roots of the cauda equina. Hemorrhage was profuse, and the operation was abandoned. Death occurred three hours later, and at the necropsy the lower vertebræ were found implicated by the tumor.

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[34] Comptes-rendus des séances de la Société de biologie, séance du 27 Juillet, 1895.

Case II.—Mrs. E., about fifty years of age, was first seen by me August 7, 1906, in consultation with Dr. N. L. Knipe, at which time the following notes were made: Pain began in the left hip one or, possibly, two years ago, but at first occurred only occasionally. In February, 1906, the pain in the left lower limb began to be severe, and Dr. Cleveland was called to see the patient. In about two weeks after the pain had become severe in the left lower limb, it was felt in the distribution of the right sciatic nerve, but here it lasted only a few days. Dr. Cleveland, when he first saw the patient, regarded the pain in the left limb as sciatica, which it resembled. The pain has persisted until the present in the left limb. Mrs. E. has always had a tendency to constipation, but this has been more pronounced during the past year. She was catheterized during one or two months while in the Presbyterian Hospital in the spring of 1906, but not since, and the retention of urine was attributed to the patient being in bed. Whether or not it was a transitory paralysis of the bladder is uncertain. Pain has been felt since February, 1906, at the end of the spinal column deep in the tissues and extending upward to about the lumbar region, but not above this. Periods of improvement had occurred. The pain came on in attacks and was very severe, and was chiefly over the sacrum and coccyx, but she has had some severe pain down the front of the left thigh. Pain was seldom in the right lower limb. It was through the left hip, but not in the right hip.

Present Condition. She has no motor weakness, no atrophy, no objective sensory changes in the lower limbs, no points of tenderness over the sacrosciatic notch, or over the sciatic nerves in the limbs. Lasègue's sign is not present, as no pain is produced by overflexing either lower limb. The left patellar reflex is diminished; the right is about normal. The Achilles-jerk is weak, but present on each side. The patient has not been out of bed for months on account of the pain. She can move either lower limb freely.

Tumor was the diagnosis made by me at this time, but the absence of motor paralysis and the almost unilaterality of the symptoms made the diagnosis a guarded one. Multiple neuritis was possible, but the severe attacks of pain and the absence of tenderness to pressure over the nerves were not in favor of this diagnosis. Vaginal and rectal examination were advised.

Dr. Knipe informed me, on August 30, 1906, that the patient had had none of the agonizing attacks of pain since she was seen by me, but this was not unusual, as these attacks had in the past recurred after long periods of comparative comfort. Dr. John Hirst made a vaginal examination, but could discover no tumor of the pelvis, no enlargement of the sacral bone, and no other abnormal condition except a deflection of the uterus to the left side and adhesions on that side. He thought this might be sufficient to cause some pressure upon the sacral roots. The patient had been complaining of great soreness in the back, especially in both buttocks and thighs.

She was seen again by me October 23, 1906, in consultation with her physician, Dr. Cleveland, when the following additional notes were made: She has had severe pain in the right lower limb about two months, but the pain in the left limb has become less severe during the past few weeks; she has had pain down the front of each lower limb, as well as down the back of the limbs. The pain has been severe in each lower limb and like toothache. Both legs below the knees feel numb, and she has a sensation as of a band about the right ankle. Since last week she has become weak in her lower limbs, but was not so previously. She has had some rise of temperature a long time, and has cystitis with albumin and casts.

Present Condition. Sensations of touch and pain are normal in all parts of the lower limbs; sensation of touch is normal about the anus and vulva and in the perineum. She can flex each thigh at the hip very little, but has more power in the legs than in the thighs. The voluntary power at the knees, ankles, and toes is better than at the hips, but is not normal. The patellar reflex is lost on each side. She has no Babinski sign, and the plantar reflex on each side is uncertain, if present. The lower part of the sacrum may be more tender to pressure, but tenderness to pressure is present over the spine as high or higher than the lumbar region. She has no girdle sensation. The muscles of the calves are a little tender to pressure. As objective sensation was normal and micturition and defecation were not much, if at all, affected, it seemed to me that the tumor could not be within the substance of the cord, nor could it have destroyed any of the roots. It probably involved the lower lumbar and upper sacral roots chiefly.

She was examined by me again in association with Dr. Frazier, November 9, 1906. The following notes were then made: The movement of the toes is performed fairly well on each side, but not with normal force. She can flex the right ankle very well, but has very little power in the left ankle. She can raise the right knee from the bed better than the left. The voluntary power at the knees is less than that at the toes. She is very weak, also, at the hips. Sensations of touch and pinprick are normal everywhere, even in the perineum and around the anus. The patellar reflex and Achilles tendon reflex are completely lost on each side, even with reinforcement. She has no involvement of the bladder and rectum. Pressure over the lumbar vertebræ gives more pain than anywhere else over the vertebræ. Movement of the lower limbs causes no pain in her spinal column.

Urinalysis. Cloudy, straw color, flocculent precipitate; neutral, 1008; albumin and sugar, negative. Under the microscope: a trace of mucus, a few white blood cells and red blood cells, a few mixed epithelial cells, few leukocytes, oxalates with triple phosphates.

Blood Examination. Hemoglobin, 90 per cent.; red blood cells, 5,440,000; white blood cells, 8960.

November 10, 1906, an operation was performed by Dr. C. H. Frazier. A horseshoe incision was made in the midline, with the base at the lower border of the first lumbar vertebra, exposing the structures from the first to the fifth lumbar vertebræ. Laminæ and transverse processes of the fourth lumbar vertebra were removed, then those of the third, and finally those of the second. There was no sign of tumor outside the dura. Nothing abnormal was observed, and no adhesions were found between the dura and the vertebræ. The dura was slit in the length of the opening in the three vertebræ. A blood clot was removed from within the right side of the dura, about one inch long, one-quarter inch wide and flat, and having a red gelatinous appearance. A soft, friable mass was seen connected with this clot, within the dura, more on the right side and opposite the body of the third lumbar vertebra. It was about one-half inch in diameter each way. The cord pulsated after the roots of the cauda equina were separated. Only a small quantity of cerebrospinal fluid escaped. All the tumor found was removed, but in pieces. There was no growth outside the dura. The dura was closed with three or four interrupted catgut sutures. The muscles were closed with continuous catgut sutures and the skin was sutured with interrupted silkworm-gut sutures. A cigarette drain was introduced down to the dura through a stab wound in the flap of the skin.

A day or two following the operation the pain in the lower limbs was intense, and weakness of these limbs was increased; but by the fifth day after the operation the pain was much less than before the operation, and the patient could draw up the lower limbs as well as before the operation, and move the left ankle and right lower limb better than before the operation. She died on the morning of November 25. The spinal cord was removed in my presence a few hours later. A cyst, almost empty, was found by the side of the lower part of the conus; it was about the shape and size of an almond and was ruptured at the lower end. The clot of blood removed at the operation probably came from this cyst. Some tissue was found within the cyst that looked like tumor, and a small mass of tissue, looking like tumor, about 2 x 4 mm. in size, was found on the roots where the tumor had been removed, that is, about opposite the third lumbar vertebra. No evidence of infection was detected.

The cyst (Fig. 1) extends within the roots of the cauda equina a half-inch upward above the termination of the conus, and is one inch long and half an inch wide. It does not implicate the roots of the lower part of the conus, and, probably because of this, the bladder and rectum escaped. These lowest roots are caught in the small mass of sarcoma tissue still remaining. The tumor is a fibrosarcoma.

In this case the pain began in the left hip. Müller says that the outer and posterior parts of the pelvis are supplied by the iliac branch of the iliohypogastric nerve and the lateral cutaneous nerve of the thigh, from the lumbar plexus (second or third lumbar, according to his chart). Later, the pain was felt in the course of the left sciatic nerve (first and second sacral according to chart), and the right sciatic was affected temporarily and later permanently. This meant extension to the sacral roots. Still later, pain was felt down the front of each lower limb (fourth and fifth lumbar, according to chart). This part is supplied from the lumbar plexus. The patient had a sensation of numbness in both legs below the knees, therefore in the sciatic distribution (first and second sacral, according to chart). She also had pain at the end of the spine. This part is supplied from the lowest sacral and coccygeal (fourth and fifth sacral) roots. The weakness in the lower limbs meant involvement

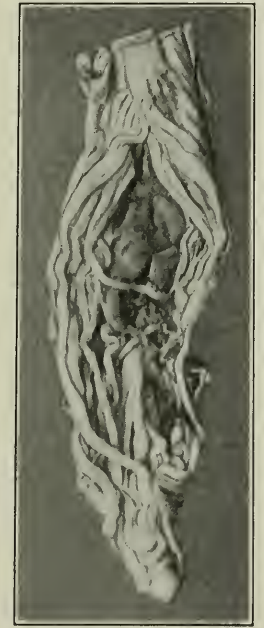


Fig. 1.—Fibrosarcoma and blood cyst in the cauda equina. Vesical and rectal symptoms were not present, although the tumor was in the centre of the cauda equina.

of lumbar motor roots, and the greater power of the legs, as compared with that of the thighs, meant less involvement of the anterior roots forming the sacral plexus, than of those forming the lumbar plexus. Loss of patellar reflexes meant lumbar involvement also. Important was the escape of the nerves for the bladder and rectum (fourth and fifth sacral, according to chart), and absence of all objective disturbance of sensation. The symptoms pointed to a lesion beginning on the left side, then extending to the right side, and involving the second, third, fourth, and fifth lumbar, and first and second sacral roots, the posterior more than the anterior. Pain alone at the end of the coccyx suggested the involvement of lower sacral nerves, but the escape of the bladder and rectum showed that such involvement if it had occurred must be slight. The tenderness to pressure was not strictly localizing, as it was felt both over the sacrum and the lumbar vertebræ. It did not seem probable that the tumor was in the center of the cauda equina, as the bladder and rectum escaped. It might be a tumor on the outside and upper part of the cauda equina not affecting the innermost nerve roots (third, fourth, and fifth sacral and coccygeal; escape of bladder and rectum); this would be indicated by the involvement of the second and third lumbar, and, later, of the first and second sacral, and fourth and fifth lumbar. It must, if within the dura, be high enough to catch the second and third lumbar roots, and if so it could hardly be a very long tumor or it would extend downward far enough to catch the lower sacral roots; nor could it be a very large tumor, as, at the exit of the second and third lumbar, it would press upon all the roots of lower origin and cause paralysis of them; or, possibly, by extending upward, might press upon the conus, in which case paralysis of the bladder and rectum would be likely to occur. It might well be a tumor of the lower lumbar and upper one or two sacral vertebræ; this would explain the escape of the bladder and rectum and the extensive area of tenderness to pressure over the sacrum and lumbar vertebræ. The second and third lumbar roots could hardly have been involved at their exit from the cord, as the implication of the fourth and fifth lumbar and first and second sacral would imply in that case a large tumor, and this would probably cause pressure upon the cord sufficient to produce more impairment of function. It was evident that none of the sensory roots was completely destroyed, as even to the time of operation no objective disturbance of sensation was found. For localization in operation, the second, third, and fourth lumbar seemed to be the proper vertebræ. The blood cyst probably caused the rather rapid development of paralysis in the lower limbs.

Case III.—H. was seen by me July 31, 1905, in consultation with Dr. MacLeod and Dr. Edward Martin. He had also been seen by Dr. Alfred Stengel and Dr. Charles K. Mills. My notes, made July 31, 1905, are as follows: In the early part of 1905 he had a fall on the ice and came down heavily on the buttocks. About three months ago he began to have pain in the lumbar region and down the left lower limb, following the sciatic nerve. In about four or five weeks the pain was felt in the course of the right sciatic nerve. The case was supposed then to be one of double sciatica, and the patient was sent to Hot Springs, Virginia. All venereal disease is positively denied, and the wife has had no miscarriages. While at the Hot Springs he found that the urine did not come promptly, and gradually retention developed, and he had to be catheterized, and his bowels became constipated. Then weakness of the lower limbs developed, and gradually became a complete paralysis. He thinks he has had some pain down the front of the thighs. Dr. MacLeod, of Bryn Mawr, who has been attending him, says that the patellar reflexes at first were very prompt. He has had no involvement of the upper limbs or of the face, but has had tachycardia; pulse, 130. He has lost flesh, is very pale and sickly looking. The paralysis of the lower limbs has developed within about three months. He has been taking 105 grains of potassium daily and as much as 6 ounces of mercurial ointment daily, and has stood this treatment well.

Present Condition. He has complete motor paralysis of the lower limbs, and cannot move the toes or the limbs at the hips. The patellar reflexes and Achilles reflexes are completely lost, even on reinforcement. The Babinski sign is not present, and there is no movement of the toes in either direction. The upper and lower limbs are emaciated. Sensations of touch and pain are lost below the knees and in the posterior part of the thighs, or, if not lost, are almost so; occasionally he seems to have a little sensation in the soles of the feet. Sensations of touch and pain are preserved in front of the left thigh, but are diminished, especially in the front of the right thigh, and are normal over the abdomen to the inguinal region, but are lost or nearly lost over the buttocks about the anus. There is some tenderness over the spine in the lumbar region, but no deformity of the spine. The cremaster reflex is lost on each side. Grasp of each hand is good. The biceps jerk on each side is prompt. The pupils are equal, and respond promptly to light. The facial nerves are not affected. The tongue and muscles of mastication are normal. The man remained in this condition, gradually losing strength, until his death, on September 30, 1905, 1 A.M. Necropsy was held by me September 30, 3 P.M.

The laminæ of the lower lumbar vertebræ were so soft they could be cut with a knife. The anterior portion of the dura was adherent to the bodies of these vertebræ, which also were soft. A mass of tumor tissue was removed, adherent to the anterior part of the dura. Numerous hard, bony-like masses were found in the roots of the cauda equina, and most of these were in the roots where they penetrate the dura; some were within roots in the dural cavity (Fig. 2). These masses, though hard, could be cut easily with a knife. No tumor was found within the cord or within the abdominal cavity. The bedsore over the sacrum was nearly round and about four inches in diameter, and extended to the sacrum. Sores also were over both heels. The lower limbs were wasted.

The tumors both within and without the dura contain numerous calcareous areas resembling imperfect bone formation; within them are many round or oval cells, and in some places spindle-shaped cells like those of a fibroma. They have the appearance of an osteosarcoma. Calcareous deposits and sarcoma cells are found in one of the tumors of the nerve roots within the dura examined microscopically.

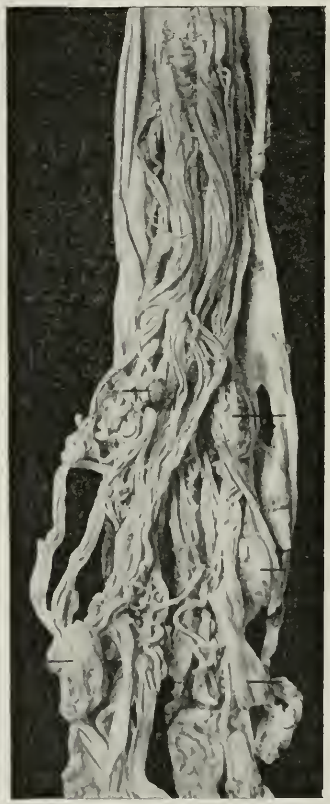


FIG. 2.—Osteosarcomas (indicated by lines) in the cauda equina.

Sections from the lumbar segments stained with thionin show much degeneration of the cells of the anterior horns, chromatolysis, peripheral displacement of the nucleus, and loss of dendritic processes (Fig. 3). The posterior columns in sections from about the twelfth thoracic region show intense degeneration by the Marchi method. Some diffuse degeneration is present in the anterolateral columns, and the posterior roots from this level are much degenerated.

Case IV.—H. H., aged fifty-five years, was seen by me in consultation with Dr. L. Loeb, September 4, 1905, at which time I made the following notes: He has been having pain in the right thigh about one year, and, although he has occasionally had pain in the left thigh, it has only been within the last two months that he has had severe pain in this thigh. The pain now is over each sacrosciatic notch and is excruciating and comes independently of any movement. Coughing or deep breathing increases the pain greatly. There is no implication of the upper limbs or head. Sensations of touch and pain are normal in the lower limbs. The patellar reflex is prompt on each side, and is shown not so much by jerking of the leg as by contraction of the quadriceps muscle, and it is prompter on the right side. Achilles reflex is not present on either side. There is no Babinski reflex, and the toes are not moved distinctly in either direction. There is no distinct tenderness to pressure over the muscles of the calf, thigh, or anywhere else; nor over the nerves, except, possibly, at the sacrosciatic notch. Some slight tenderness to pressure is felt over the lumbar region. The spinal column is not deformed. He has control of the urine and feces. There is no localized atrophy, although he has lost flesh generally. The pain seems now to shoot down the legs, following the sciatic nerves, and extends to the feet, and movements of the patient cause pain. The lower limbs have good voluntary power, and whatever apparent loss of

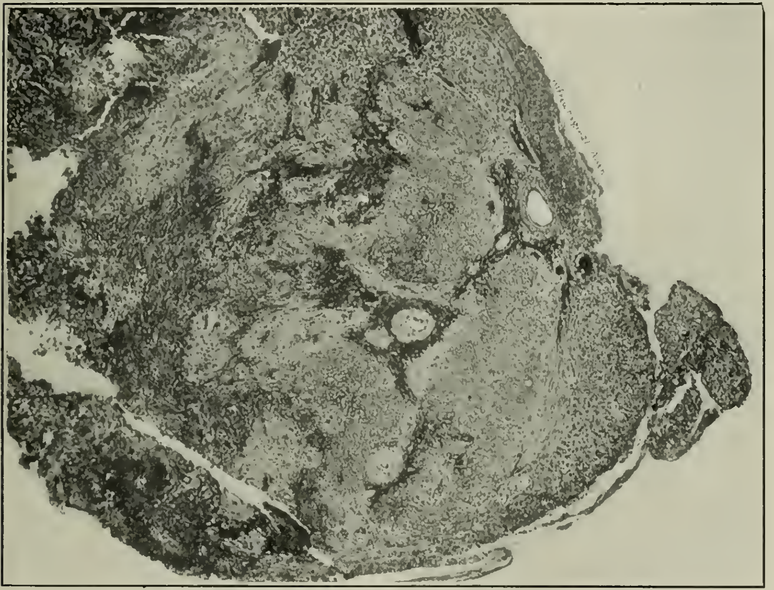


Fig. 3.—Osteosarcoma in one of the roots of the cauda equina. The dark patches indicate calcareous deposits.

power there may be is probably because of the pain. The pain, by extending from the front of the thighs to the back, and in being bilateral, suggests pelvic tumor.

Additional notes were obtained from Dr. W. W. Keen.

December 5, 1906. In the summer of 1903 he fell about four or five feet while building a dam. His knees caught between some rocks and stopped his fall forward, and he fell backward, but did not strike the end of his spine or injure himself in any way, excepting that his knees were bruised by the rocks.

He had drunk quite freely in past years. About eighteen months to a year ago (a little longer than in the statement made to me) he began to suffer pain in the right sciatic nerve. Some months later in the left sciatic; later still, the pain involved the anterior crural, first on the right side, and later on the left side. He has had also some diffuse pain in both hips. The pain has been progressive, but has been worse of late on the left side. He has had some obscure sacral pain, but none in the lumbar region. About four or five weeks ago he began to lose power in the lower limbs, first in the right leg, then, about three weeks ago, in the left leg, after a severe attack of pain. The bowels and bladder have never been involved in any way. There is no local muscular wasting.

When Dr. Eshner first saw this patient about four weeks ago the patellar reflex on the left side was absent; on the right side it could just be elicited; both of these tests being with reinforcement. There was no plantar reflex. Babinski's sign on the left side was doubtful. Cremasteric and anal reflexes were normal. The man has never had any fever excepting two months ago, when for three or four days his temperature ran up to 103° from some temporary gastric disturbance. Bowels are regular. An *x*-ray photograph showed no alteration. There has been no loss of sexual power, but inability to perform the sexual act on account of pain.

Dr. Harvey Cushing, in examination of the pelvis, found nothing wrong. Dr. Keen found that the cremasteric reflex was elicited only on the inside of the thigh, but was quite well marked on both sides. The patellar reflexes were absent, and there was no Babinski reflex. The man could voluntarily draw up both legs well, the right more forcibly and quickly than the left, which moved feebly and after repeated efforts. He could stretch out both legs, the right better than the left. Examination of the back showed no tenderness in the lower dorsal, lumbar, or sacral region either upon pressure or sharp percussion with the fingers. Mercury and potassium iodide had been used to the limit of tolerance.

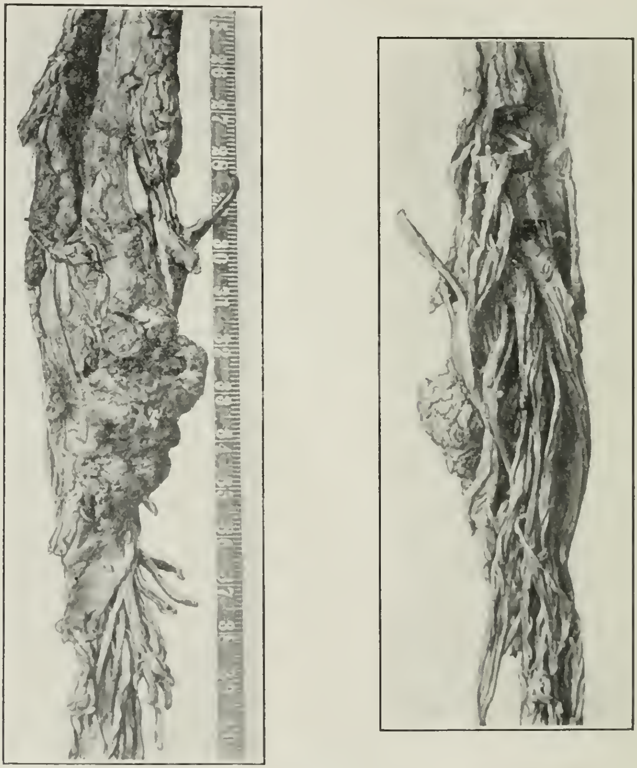
On December 9, 1905, a consultation was held with Drs. Mills, Eshner, Keen, and myself, at which time the following notes were made: In the left leg foot-drop is almost complete. Whether this was true four days ago Dr. Keen did not know. There is no Achilles-jerk on either side. Voluntary flexion and extension of the toes and ankle on the right side are present, but, except in very slight movement of the toes, are absent on the left. The movements are very weak in the whole left leg. On the right side they are impaired, but much less so than on the left, and are worse below the knee than above. There is no anesthesia anywhere. On the dorsum of the left foot there is very slow appreciation, with slight diminution on the left thigh posteriorly. Sensation on the scrotum is normal. On passively moving the right leg considerable pain is felt in the sacral region. Moving the left leg, the pain is much more acute in both legs. It is especially elicited by flexing the leg on the thigh and the thigh on the pelvis with the thigh in abduction. Grasping the muscles of the anterior part of either thigh and compressing them elicits considerable pain on each side, but more on the left. Squeezing the foot on either side is especially painful, particularly so on the left. There is no pain or muscular disability in the arms. The back is rigid. The man was made to sit on the side of the bed, and this position produced marked pain in and about the right trochanter; in the joint, as he expressed it. The pain also extended over the right buttock and sacrum. The conclusion was reached that the lesion was probably either a neoplasm in the spinal canal, most likely in the cauda equina, or possibly a pelvic sarcoma, which, in consequence of the patient's large form and great stoutness, could not be detected. Laminectomy in the lumbar region was decided upon.

Operation December 10, 1905. Dr. Keen removed the laminæ of the first, second, and third lumbar vertebræ. The dura was divided the length of the wound. The tumor was not found. The temperature rose to 101° within a few hours after the operation, and fluctuated between that and 102° until he died at 1.45 A.M. on the 12th, about forty hours after the operation. Œdema of the lungs set in speedily after the operation, and the patient gradually lost consciousness. His pulse rose to 156, and later became uncountable. The necropsy was made by me.

A tumor was found on the anterior part of the spinal dura. It begins just above the exit of the second lumbar roots from the dura and extends to the exit of the third lumbar roots, and is more on the left side in its upper part, but not in its lower part. The cord appears somewhat swollen just below the portion exposed at the operation. The dura was adherent to the bodies of the vertebræ just below the part exposed at operation. The bodies of two or three vertebræ at the level of the tumor were soft and could be partly penetrated by the knife. The tumor seemed to have originated in the bodies of these vertebræ. The stitching of the dura ended just above the upper part of the tumor (Figs. 4 and 5).

The tumor contains round and oval cells and also spindle-shaped cells, with considerable fibrous connective tissues, and has the appearance of a fibrosarcoma. The nerve cells of the anterior horns in the lower lumbar and upper sacral region show intense degeneration, peripheral displacement of the nucleus, chromatolysis, loss of dendritic processes, and vacuolation. The alteration of the cells is equally intense on both sides of the cord.

Sections from the fourth lumbar segment show intense degeneration of the left posterior column by the Marchi method, and of the posterior root fibers entering at this level, but only a slight degeneration of the right posterior column. The degenerated fibers are found also in the left anterior horn. The degeneration by the Marchi method is very slight at the first sacral segment, but is more pronounced on the left side. It is more pronounced at the third sacral segment, and here also is greater on the left side, but is not nearly so great as at the fourth lumbar segment.



Figs. 4 and 5.—Extradural fibrosarcoma over the roots of the cauda equina. The stitching of the dura ends just above the tumor, shown as a mass of tissue on the outside of the dura.

Case V.—The notes and pathological material of this case are obtained from Dr. Charles K. Mills. S. D. C., aged sixty-two years, white, male, living at Kennett Square, Pennsylvania, was seen by

Dr. Mills in consultation with Dr. U. G. Gifford, March 15, 1902. He was well until August, 1901, when he first had pain in the back and along the distribution of the left crural nerve and the thigh. He gradually lost power in the left leg, and before this loss was complete the right leg also became affected, the loss of power gradually increasing until, by December, he was almost completely paralyzed in both lower extremities. He had more or less diffuse pain in both legs, but this was most marked in the anterior portion of the left thigh. Early in the case there was tenderness as well as pain in the distribution of the left crural nerve. In December, 1901, and January, 1902, he complained of much pain in all parts of the legs. This pain was not only subjective, but he had much pain on movement of the legs and trunk and also in spots on handling the legs. Taking hold of the legs about the ankle, for instance, would cause him to cry out with pain, and this without any movement of the limbs or body. Later, the pain on handling became less, but he continued to suffer with severe pain in the back, and also with pain which radiated from the back and down the limbs. From about the middle of December his bowels began to be inactive, and in a short time were completely torpid or paralyzed. Later, about the middle of February, incontinence of the sphincter ani came on, and he had at times involuntary evacuations. He never lost control of the sphincter of the bladder, nor were the bladder walls paralyzed, although he occasionally had some apparent difficulty in completely emptying the bladder. He was catheterized by Dr. Gifford, who found no residual urine. Sensation was retained, except, perhaps, on the inner anterior aspect of the thighs, where he was slightly hypesthetic. He had no girdle sensation.

When examined by Dr. Mills, March 15, 1902, the man was in bed on his back and unable to move without assistance. The movements of the thigh on the pelvis and extension of the leg on the thigh on the left side were completely lost; on the right side the conditions were similar, but the loss of power was not so complete. The anterior aspect of the left thigh showed marked atrophy, and no responses to the faradic or galvanic current could be obtained in the quadriceps and other muscles of this aspect of the limb. The same was true on the right side. The movements of the foot were preserved, but impaired, and this was especially true on the left side, that is, he could dorsally flex, extend, adduct and abduct the foot and perform various movements of the toes, but these were impaired and somewhat uncertain, especially on the left. The muscles below the knee were somewhat wasted, but not distinctly atrophied, and responded to the electric current, but there was some quantitative diminution. Sensation was retained, except the slight partial loss over the anterior aspect of the thigh, where the responses were somewhat uncertain. The bowels and bladder were as above noted. Knee-jerks and quadriceps jerks were abolished; no clonus was obtained; he had the Babinski reflex on the left side, and on the right side there was no reflex movement of the toes. At this time the man still complained of much pain in the back and at times of pains radiating to the groin and into the limbs. He was not tender to pressure over the nerves of the extremities, and pain was not caused by lateral squeezing or other manipulations of the foot. The spine was rigid, all movements being restricted. Jarring caused some pain. Percussion and deep pressure caused pain over the position of about the second and third lumbar vertebræ, where there was a slight deformity. He had no symptoms above the waist line.

The movements of the right foot and leg were as noted at the time of this examination, but a few weeks previous to this the loss of power had been greater, and was then somewhat more marked on the left side. Under treatment he had regained in part the movements of the foot on the left side, but no improvement took place in the muscle groups above the knee.

About the 16th or 17th of the month his temperature began to rise; he had frequent and profuse sweating; he sank into a torpid and eventually into a typhoid state; at times he was delirious; he gradually became weaker, and died March 25.

The necropsy was held ten hours after death by Drs. Gifford, Reynolds, and Darlington. In opening the spine the left transverse process over the third lumbar vertebraæ was seen to be necrosed. It was loose and dropped out; no pus was present. The posterior arches were removed from the twelfth thoracic vertebra to the sacrum; the layer of fat and cellular tissue between the periosteum and dura was normal, except at the first, second, and third lumbar vertebræ, where it was replaced by what appeared to be a growth, at least, by a reddish, fleshy-looking mass (Fig. 6). The dura was congested, and the spinal fluid was turbid and bloody. Examining the bodies of the vertebræ laterally and in front, they were found to be decidedly diseased, especially on the left side and in front. Pus, with broken-down bone, could be seen and felt. Between the dura and the bone was a large fleshy mass. This occupied the position in front and on each side of the cord. . The cord itself was intact, although probably considerably flattened. Permission was given to remove the cord and attached mass, but not the bone.

Microscopic examination of the extradural tumor showed it to be an endothelioma.

Case VI.—Probably tumor of the cauda equina. Mrs. E., aged fifty-two years, was seen by me in consultation with Dr. S. Stalberg in the beginning of 1906, from whom the following history was obtained: She was born in Russia. Family history negative. Occupation, ordinary housework duties. She has had eleven children, of whom nine are living, and has had no miscarriages. She has never been sick, except many years ago, when she had hemoptysis during pregnancy. No rheumatism or tuberculosis has occurred in the patient or family. Present illness began about five months ago, with pain and tenderness over the right sciatic nerve at its point of exit from the innominate bone. This was followed in two months by the same condition in the left side, though on the right side the pain was always more severe. At the end of the third month of her illness she had quite profuse uterine bleeding lasting three or four days, her menopause having occurred two years previously. This bleeding was followed by another in two weeks. A vaginal examination was made by Dr. Dorland, who attributed bleeding to an eroded cervix, but he was unable to find either uterine cancer or any other pelvic condition causing the "sciatica."

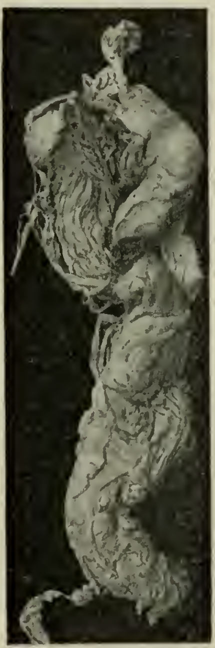


Fig. 6.—Endothelioma on the outer part of the dura over the cauda equina. The tumor has been cut through.

Almost all of the antirheumatics and analgesics, nitroglycerin, potassium iodide, mechanical means, such as splint (for a few days) and compression, bloodless stretching, were tried, but without success. The pain became intense, extending to the muscles of the thigh and to the knee and back.

Notes dictated by me on February 6, 1906, are as follows: She is in great pain. Passive extension of the lower limbs causes much pain. The lower limbs are not greatly wasted. She can flex either leg at the knee to about the normal extent, but can flex either thigh at the hip only partially, and she prefers to lie with thighs partly flexed, in order to avoid stretching the sciatic nerves. The patellar reflex is present, but diminished on each side; she has no movement of either leg on the thigh, and merely slight contraction in the quadriceps muscle, which is weaker on the left than on the right side. She cannot be tested for tactile sensation on account of the difficulty to make her understand. The Achilles reflex is present on each side, but diminished. The muscles of the calf and thigh seem to be somewhat tender to pressure, but it is impossible to tell to what extent. She seems to have voluntary movement of the feet. She complains of some pain in the lower part of her abdomen, but the abdomen does not seem to be at all tender to pressure. The muscles of the abdomen are so flaccid that it is impossible to determine any abdominal reflex. There seems to be no tenderness over the spinal column, and no deformity of the vertebræ. She has no disturbance of the bladder and rectum.

February 27, 1906. Extension of the right leg on the thigh, or left leg on the thigh, causes pain as soon as the leg is almost fully extended. The patellar reflex is much diminished and apparently lost on each side. Achilles-jerk on either side is much diminished. Muscles of calves are very flabby, but pressure of them does not seem to cause intense pain. She has great difficulty in flexing either thigh on the abdomen. She can move either leg on the thigh much better than she can move the thighs. She has no Babinski reflex. Pinprick is perceived in both legs. There is no disturbance of sensation around the buttocks or in either lower limb, objectively tested by a pin. She says the spinal column is tender to pressure in the lower part, but this tenderness cannot be tested positively. It cannot be determined whether there is any diminution of sensation or not. Any turning of patient in bed causes great pain, and the sciatic notch is very tender.

March 26, 1906. The lower limbs are weaker than they were when she came to the hospital, especially the right. Sensations of touch and pain are normal in the lower limbs. The patellar reflex is greatly diminished on each side, or even lost. The Achilles reflex is prompt on the left side, lost on the right. She still has perfect control of the bladder and bowels. Muscular atrophy is present in each leg, especially the right. Babinski's sign cannot be determined, because of resistance of patient. She has some tenderness to pressure in the lumbar region, but no deformity.

The patient left the hospital, and Dr. Stalberg informs me that she died about May, 1906, six weeks later. She was not under his care at that time, but her symptoms during these last weeks of her life were about the same as during the previous period.

Operation was not desired by the patient, and a necropsy was not permitted.

Case VII.—This patient, a woman about forty years of age, was seen November 1, 1906. She had had signs of pulmonary tuberculosis, and had had for some months pain in the right lower limb and in the lumbar region. About October 24 she had become rapidly paralyzed in both lower limbs.

The notes of her condition at my examination are as follows: The lower limbs are completely paralyzed, with the exception of slight movement at the hips. The muscles of the entire limbs are slightly sensitive to pressure. The patellar reflex and Achilles tendon reflex are completely lost on each side. Babinski's reflex is not obtained. Pressure over the muscles of the calf causes no movement of the big toe. There is no control of the bladder or bowel. Sensation of pin-prick and touch seems to be about normal over the front of each thigh; it is completely lost over the left buttock, to about four and one-half inches from the anus, and the line of demarcation seems to be sharp. It is lost to about the same extent over the right buttock, but the limitation of this side was not accurately determined, in order to avoid disturbing the patient. The sensation of touch and pain is lost in a narrow zone down the back of each thigh, to, or nearly to, the popliteal space. It seems to be lost or greatly impaired down the back of each thigh, and in the sole of each foot. In the rest of each leg below the knee sensation to touch and pain is greatly impaired, as compared with that of the upper limbs. There is no tenderness over the spine, sacral or coccygeal regions, nor has there been. The paraplegia of the lower limbs occurred within twelve hours, about October 23, 1906. She was probably getting weaker in the lower limbs some time before this. The subjective pain in the left lower limb has been present only about a week, and is about in the same distribution as in the right lower limb, namely, in the outer portion of each thigh. The pain in the right lower limb had been present several months.

A necropsy was not obtained in this case.

In addition to these seven cases, I have observed, as a chance finding at necropsy, in the service of Dr. Dejerine at the Salpêtrière, a lipoma of the filum terminale and a small osteoma of one of the roots of the cauda equina.

The following case is one in which a diagnosis has been very difficult:

Case VIII.—H. H. P., aged thirty years, was first seen by me in consultation with Dr. A. D. Whiting, February 12, 1903. He had done heavy manual work. He was struck on the outer side of the right knee about eight years ago. He had an extensive synovitis for three months only. In February, 1902, he began to have pain in the right knee. No cause was known for this, and he had not had any injury. He had been working very hard during a strike and over hours. He went out in all kinds of weather and had great exposure, with little rest. Pain came at first in attacks, and the first attack came after he had been out with the snow sweepers. He has never had pain anywhere else than in the right thigh. At first the pain was in the right knee only, and later he thought it extended from the knee up the thigh. He has been treated only for knee trouble. He has pain in the right hip now also, and thinks he has it in the outer and inner sides of the right thigh. It is a steady aching pain, but at times sharp and cutting. When he has the pain all the muscles of the right thigh are sore to pressure, but no tenderness is felt except when he has pain. It is worse at night and when he is in bed. He has been to Hot Springs, Virginia. Atrophy seemed to increase when he was in bed. He had gonorrhœa ten years ago, but never syphilis. An x-ray photograph shows nothing in the knee or pelvis, but the acetabulum of the right side may be a little roughened. Dr. Willard says the patient has not bone or joint disease. No malignant history in family, but there is tuberculous history on the mother's side. Very recently he has had a sensation like a tired muscle pain on the outer side of the right leg below the knee. He had been riding horseback before he had pain below the knee. Two other children are in the family. A sister died of typhoid at the age of twenty-three years, in May, 1900. She was fairly well until she had typhoid. An older brother is living and has some bronchial trouble ("fibrinous bronchitis").

Present Condition. February 12, 1903. The patellar reflex is distinctly exaggerated on each side, but more so on the right, where it is much increased. Dr. Whiting says every reflex was normal six weeks ago. Patellar clonus is obtained on the right side, not on the left. Slight indication of ankle clonus on each side. No Babinski is found on either side, and the toes, including the big toes, are flexed. Achilles-jerk is very prompt on each side, and a little exaggerated. Middle of right thigh measures 15¼ inches; left thigh, 16 inches. Middle of right leg measures 12½ inches; left leg, 12¾ inches. The atrophy in the right thigh, inner and outer aspects, is very visible; atrophy of the right leg is also very distinct, but the atrophy of the right thigh is greater than that of the right leg.

Station and gait are nearly normal, even with the eyes closed. He has no Romberg sign and no bladder and no rectal symptoms. Tonicity of lower limbs is about normal. Sensations of touch, pain, and temperature are normal in the lower limbs and equal on the two sides. A slight tendency for the right foot to turn inward is observed. Cremasteric reflex is present on each side, but not very prompt on either side, and more distinct on the left side.

Upper limbs are not atrophied, but he has lost weight generally. Biceps tendon, triceps tendon, and wrist reflexes are very prompt on each side, but biceps tendon reflex is distinctly prompter on the right side. Voluntary power and sensation of touch, pain, and temperature are normal in the upper limbs. Resistance to passive movement is normal in the upper limbs. The hands are not wasted.

Blood examination gives normal findings: hemoglobin, about 87 per cent; over 4,000,000 red blood corpuscles.

Urine, normal; a faint trace of albumin was found only once.

The head is normal. The tongue is protruded straight, not atrophied. Jaw-jerk is not increased. Masseter muscles contract firmly. He has no involvement of muscles of the seventh nerve on either side. The pupils are equal, irides react normally to light, in accommodation and convergence. Movements of the eyeballs are normal. Vision is good.

It is not known how long the atrophy has been present in the right lower limb.

He has no pain on pressure over the spinal column, or on pressure of the head and shoulders downward.

I saw this patient again May 2, 1903. Pain is constant; it has never been better, and at times a little worse than when last seen. The character of the pain has changed; it is sharper, and when he is walking it seems to be confined to the knee. He has no pain in the left lower limb. When he is awakened at night the pain seems more in the hip, and at times in the back. He has no symptoms on the part of the bowels or bladder. His right foot gets cold at times. Pain is still along the front of the thigh, not along the back of the thigh, and not usually below the knee, except occasionally it extends a little below the knee on the front of the leg.

Resistance to passive movement is a little less in the right lower limb. Right thigh (a little below the middle) measures 15 inches; left, 15¼ inches. Right leg measures 13 inches; left, 13 inches. The right lower limb does not appear so much atrophied as it did previously. The right patellar reflex is normal. There is no patellar clonus on either side. Achilles reflex on each side in Babinski position is about normal; if anything, the right is a trifle weaker than the left. Sensations of touch, pain, and temperature in lower limbs are normal, even in front of the right thigh. Gait is normal, except when he has pain. He had some pain just above the pelvis in back during past three weeks; since, he has had passive movement of limb. The pain seems to be confined to the distribution of the right external cutaneous nerve.

The eyes were examined by Dr. Shoemaker. His report is as follows: "The results of my investigations into the ocular condition of the patient are negative. His vision, accommodation, fundus, pupils, ocular movements, muscle balance, and visual fields are normal."

I saw him again November 14, 1903. He had been in California for five months riding horseback and exercising in the open air, and had had Swedish movements, hot sulphur and hot mud baths. The pain has continued as severe as ever, and is in the same place. Sometimes he has pain above the crest of the ilium, and it may extend as high as the lumbar region. He thinks the pain is a little more severe at times. He has never had pain in the back of the thigh nor on the inner side of the thigh. On rare occasions it may extend on the outer side of the right leg half way below the knee. Never has he had any pain in the left lower limb, and never had disturbance of bowels or bladder. He has been *x*-rayed repeatedly, and nothing abnormal has been found. Pain is worse about 2 inches above the patella on the outer side of the thigh. Middle of right thigh measures 16½ inches; of the left thigh, 17 inches. Middle of right leg measures 12½ inches; of left leg, 12½ inches. The right thigh is distinctly atrophied, especially in its inner portion. He weighs now 130. Normal weight is 150. The whole right lower limb is distinctly wasted, but more in the thigh. The gluteal muscles on the right side are also wasted.

The patellar reflexes are prompt, probably more so than normal, but not excessively so. Patellar clonus is not present on either side, and he has no ankle clonus on either side. Achilles-jerk is about normal on each side. Sensations for touch and pain are normal in all parts of the lower limbs. He walks now with a little limp in the right lower limb. No points of tenderness are found in the lower limb. The patellar reflex on the right side may not be quite so prompt as at the former examination.

He was seen by me again April 30, 1904. Since he was last seen Dr. Whiting cut the external cutaneous nerve, December, 1903; he did not suture it or bring the ends together. In February, 1904, Dr. Whiting made an exploratory operation in the lower part of the right thigh, and nothing abnormal was found. General condition has been good, with, at times, mental depression. Pain is unaltered. It still centres about the knee, but extends now more below the knee than into the thigh. He limps, but limping seems to depend upon the pain and varies with the intensity of the pain. The electrical reactions are normal in quality, but diminished quantitatively. The right lower limb, both thigh and leg, is distinctly wasted, and the wasting of the leg is greater than it was at my last examination. The patellar reflex on the right side at times is weak, the leg is thrown forcibly out, but the movement is sluggish. The patellar reflex on the left side is about normal. The Achilles-jerk on the right side, Babinski position, is not quite so prompt as on the left side. The pain is usually on the outer side of the leg, below the knee, seldom on the inner side of the leg, and is of the same character—"sharp, like a toothache or headache—a steady grind, never darts down the limb." Resistance to passive movement is not so good in the right lower limb (flexion and extension of leg or foot) as in the left lower limb. He is analgesic and anesthetic in the outer part of the thigh in the distribution of the external cutaneous nerve, but he has no paresthesia in this area. He has no Babinski sign on either side. Gait is not ataxic, even with the eyes closed. No vesical or rectal disturbance.

At the present time, February, 1907, his condition is about the same as at my last examination. He has been seen by Drs. Osler, Erb, Gowers and other neurologists in this country and in Europe. A small non-malignant tumor, such as the small osteoma I have described above, implicating a few nerve roots, might explain the symptoms in this puzzling case.

I am indebted to Dr. Alfred Reginald Allen for most of the photographs.

MORBID SOMNOLENCE.

By D'Orsay Hecht, M.D.,

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Our present state of knowledge, or lack of it, concerning morbid somnolence, justifies, I believe, this somewhat more than cursory comment of a case seen for the first time during October, 1906:

W. L. J., male, colored, aged forty-eight years, a native of Kentucky, twice married, and a sleeping-car porter by occupation, was kindly referred to the neurological clinic of the Northwestern University by Dr. Gottfried Koehler, whose privilege it had been to observe the patient for a brief period in the medical department.

The essential complaint appearing in the first-taken medical history was that of inability to keep awake. The patient had for a long time prior to his visits to the clinic received various treatments, all aimed at overcoming attacks of sleepiness. From medical premises, a group of symptoms were revealed consisting of very moderate dyspnœa, occasional, severe, but short-lived pains about the heart, insignificant swelling about the feet and ankles, frequent micturition at night, slight periodic headaches, a large appetite, and an inordinate thirst for water. Dr. Koehler reported several analyses of single and twenty-four hour specimens of urine, which showed an average of 0.4 per cent. albumin in 3000 c.c. voided, and the presence of granular, epithelial, and fatty casts in the centrifuged sediment; sugar was absent. The heart was found to be somewhat displaced downward and to the left, the apex beat extending to the nipple line; the second pulmonic sound was not very clear; the second aortic sound was slightly accentuated, but murmurs were not heard. Œdematous swellings at the ankles or along the extremities were not noted, although the patient referred to their occasional presence. These evident signs of renal and cardiac embarrassment, together with the aforementioned subjective symptoms, were taken to indicate the presence of a secondary contracted kidney.

The patient is rather obese, having weighed between two hundred and two hundred and sixty pounds for the past twenty-five years, but is doubtful whether this surplus weight is in any way a factor in initiating the sleep seizures. Oft-recurring and excessive drowsiness rather readily lends itself to a presumption of organic brain disease, chiefly of a luetic nature and to admit or dispose of its likelihood in this case, a careful examination of the nervous system was undertaken. There were several physical findings of interest from a neurological viewpoint, but special stress is given the sleep phenomena.

There is a white strain in the paternal antecedents, proudly admitted by the patient and evidenced by his yellowish-black complexion. His childhood was free from attacks of acute infectious disease, and he recalls nothing eventful during adolescence, except two severe spells of "chills and fever" which yielded promptly to quinine. Specific disease acquired at eighteen, and but very indifferently treated, caused an illness of more than a year's duration characterized by sore throats, bone-pains, and vesperal headaches. This experience, however, together with that of a gonorrheal infection occurring shortly thereafter, did not deter him from marrying at the age of twenty-two. It is worthy of emphasis that his wife had neither children nor miscarriages and at thirty-eight years of age experienced a paralytic stroke, which terminated fatally within twenty-four hours after the onset. A second marriage likewise has been completely barren. At the age of forty the patient contracted a severe attack of la grippe, from which he thinks he never fully recovered, and he is disposed to regard this illness as the direct forerunner of his present complaint. It may be relevant to add, that the patient smokes and drinks very moderately, partakes of little coffee or tea, has cultivated no drug habits, and says he is sexually temperate.

The sleeping spells have appeared with gradually increasing frequency and duration since 1895. At first he thought lightly of his "naps" attributing them to the long-waking hours incidental to porter service and railroading, until one day he fell asleep in the midst of making up a bed and on another occasion "suddenly dropped off" in the course of a conversation. "Sleepy Bill," as his associates were prone to call him, finally had so much difficulty in keeping awake that he left "the road" in 1902. Ever since that time he has sought various kinds of employment, but once caught sleeping, is unable to retain his position. Keeping constantly on the move or doing real, active, manual labor is his only hope of keeping awake.

He experiences an unconquerable desire to doze about every three hours, much depending upon the quiet and solitude of his surroundings. If not disturbed, sleep lasts from one-half to one hour; is perfectly refreshing and so light withal, that nothing said within hearing distance escapes him. In this connection he relates an unpleasant incident of having fallen asleep in a crowded lunch-room, when he overheard the unkind remark "see how he sleeps; I'll bet he hasn't an ounce of brains;" he snored and slept on, but on awaking showed his resentment by knocking down the offender.

In attendance at church he falls asleep, but hears every word of the sermon and only realizes that he was asleep when told so by others. The onset of the slumber is sudden, coming on without warning and unaccompanied by peculiar sensations other than mere drowsiness, giving way quickly to deep sleep. The ease with which he is aroused is significant, a soft word or light touch being sufficient. He is immediately himself, free from even the slightest bewilderment, without dizziness, without headache, without mental hebetude or depression. In the interval between naps there is no drowsiness. Dreams, chiefly of the terrorizing kind, not infrequently disturb his slumbers. The longest single period of day-sleeping has been one hour. The patient can tell the difference between these and the natural night sleeps or the normal tired states preceding them. Recently, while demonstrating his case, he had an attack and when last opthalmoscoped he was overpowered. Several times he has slipped from a high stool while writing and sank to the floor in sound sleep.

After a normal night's rest he is refreshed, but nevertheless gets up with great reluctance and says he could easily sleep all day with short intervals for food and drink. His fear of detection has been great, but his determination evidently insufficient to overcome the irresistible impulse.

An examination of the nervous system points to some organic impairment, although the anomalies noted do not satisfactorily account for the sleep seizures.

The pupils are of normal size, react properly to light and accommodation; no ocular palsies. Dr. Mortimer Frank, to whom I am indebted for a painstaking examination of the fundi, reports them negative; visual acuity of $\frac{6}{5}$ in right eye, and $\frac{6}{6}$ in left eye, with Jaeger test type No. 2.

The conjunctival reflex is brisk; the faucial reflex present, but not marked; jaw jerk normal; wrist taps present and bilaterally equal; right patellar normal and with reinforcement very brisk; left patellar absent except with reinforcement; right cremaster brisk; left cremaster very sluggish; left Achilles jerk obtainable (positive) without reinforcement; right Achilles present only with reinforcement; both plantars present on rather sharp stimulation; Babinski toe sign absent.

Coördination is everywhere good, there being not the slightest evidence of ataxia of gait or station; and no ataxia in the upper extremities. No sensory disturbances of any kind, subjective or objective, are noted at the present time.

The abdominal viscera are apparently normal. An analysis of the stomach contents was not made. Of the thoracic organs the heart has received mention and the lungs were found to be normal. There was no marked adenopathy.

The medical diagnosis submitted, based on signs and symptoms of moderate severity, was one of secondary contracted kidney. It is not unlikely, I think, that the anomalous state of the tendon reflexes, namely, their contralateral disparity, results from a past spinal lues, although in the absence of more definite motor or sensory disturbance, this is taking perhaps much for granted. It would surely be less rational to think of such variability in tendon reflexes as hysterical, and to suspect a cerebral lesion seems altogether far-fetched. Perhaps it were as well to suspend diagnosis and say, that whatever the pathology in question, it is quite unrelated to the sleep attacks at issue. This brings us to a consideration of the causes of morbid sleep states, which subject is impossible of comprehensive treatment without references to previous views and writings.

Narcolepsy is the term now universally accepted to designate a state of pathological somnolence. By it we mean an irresistible, uncontrollable inclination to sleep, which overtakes the individual suddenly, lasts for a variable period, and recurs at frequent though irregular intervals. Gelineau[1] in 1880, gave us the first definition and description of narcolepsy as a disease sui generis.

In a rather meagre literature, handed down to us before and since the time of Gelineau's characterization of a "sleep neurosis," the citations under the name of narcolepsy set forth the most weird and perverse forms of somnolence without the least regard for etiological factors or the presence of associated disease. In 1884, C. L. Dana[2] reported 7 cases which he held to be "in the main expressions of some neuropathic state" and then offered a clinical classification which was intended to differentiate sharply essential from secondary forms of morbid somnolence. Sympathetic somnolence might arise from senile and cardiovascular changes; might be due to exhaustion, obesity, organic cerebral disease, and diabetes, or be derived from the toxemias of malarial, uremic, cholemic, and syphilitic disease. The essential forms may be classified as follows: (1) Epileptoid sleeping states. (2) Hysteroid sleeping states including (*a*) spontaneous "mesmeric" sleep, (*b*) trance and lethargic states. (3) Morbid somnolence, the expression of a distinct neurosis (narcolepsy). Dana's analysis of his cases went far to show the existence of a narcoleptic state per se, since a most painstaking inquiry into the physical condition of the individual patients failed to reveal a cause for the somnolence.

McCarthy[3] believes with Ribakoff that "sleep attacks" constitute one of the phenomena of degeneracy; that these cases occur in degenerate individuals; and that the recurring attacks of sleep are not the disease, but merely a syndrome occupying a prominent position among other phenomena of degeneration."

To add to the growing perplexities of the problem, Furet[4] and

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[1] De la Narcolepsie, Gazette des Hôpitaux, 1880, p. 626.

[2] Jour. Nerv. and Mental Dis., 1884, xi, 153.

[3] Amer. Jour. Med. Sci., February 1900, p. 178.

[4] De la Narcolepsie, Thèse de la Faculte de Paris, No. 303, Roussl.

Sainton[5] affirm an autotoxic pathogenesis. Furet states that diabetes, influenza, and even epilepsy arise from endogenic intoxicants—that narcolepsy may be an associated symptom in any of these disorders—ergo an autotoxic pathogenesis is the near explanation. Stern[6] attracted to Furet's views has occupied himself with most elaborate analyses of the blood and urine, of stomach contents, and animal experiments in a case of narcolepsy, and concludes that autointoxication played no part whatever in the sleep seizures of his patient.

Ballet thought the term narcolepsy should include all degrees of somnolence from the mildest drowsiness to the deepest sleep and he so applied it, even to calling "the nap" after a heavy meal, narcoleptic.

Lowenfeld[7] is the last writer to survey critically the narcolepsy question, if such it may be called, and favors the retention of the word "narkolepsie" to designate a distinct neurosis. He does this only after a searching analysis of Gelineau's text in which motor inhibiting phenomena (motorische Hemmungsvorgänge) receive consideration quite as fully as the sleep attacks. He maintains that the morbid process in the brain giving rise to the one is equally responsible for the other and in the absence of demonstrable structural changes the syndrome must be classed with the neuroses. If any reticence has been shown in accepting Gelineau's narcolepsy as a distinct disease, I believe it is owing to the author's failure to force upon the attention of subsequent readers and observers the very points more clearly enunciated by Lowenfeld. An opportunity was seized to combine loosely all pathological sleep states and sleep-like states (Schlaf-zustande and schlafartige Zustande) and qualify them as hysterical, epileptic, or diabetic under the broad caption of narcolepsy.

Here, as elsewhere in medicine, we are witnesses to a quibbling over what shall constitute a morbus sui generis or clinical entity as we are pleased to translate it.

A brief sleep attack is frequently a conspicuous feature in the petit or grand mal type of epilepsy. A patient so afflicted is not easily aroused and experiences some mental torpor for a time after awakening, which in turn may be followed by a variable period of gloom and depression.

The narcoleptic habit is not an uncommon incident in the course of diabetes. Sleep attacks then of abnormal type are associated with these diseases, and it should be added that the stuporous state of cerebral syphilis requires differentiation. In this case the evidence of past syphilis, the presence in a mild degree of renal disease, and the element of obesity, seem separately or in combination to offer an explanation for sleep attacks, and yet the narcoleptic habit is here sufficiently pronounced and distinctive to merit, in my opinion, its presentment under the caption of morbid somnolence.

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[5] Gaz. hebdomadaire de méd. et chir., No. 34.

[6] Med. Record, 1902, p. 47.

[7] Münch. med. Woch., 1902, p. 1041.

A FATAL CASE OF PONTILE HEMORRHAGE WITH AUTOPSY.

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References to pontile hemorrhage are comparatively rare in the literature. But sixty-seven papers on the subject are noted in the Index Catalogue of the Surgeon General's Library, published in 1890, and of these but very few are of American origin. I have not attempted to gather all cases published since 1890; but reference to some of the more important of them is appended to this report. The text-books have but little to say on the subject, and many of them omit all mention of it. Among the few text-book writers who speak of pontile hemorrhage is Guillian,[1] who mentions, among its symptoms, the following: vomiting, irregular respirations, polyuria, single or double hemiplegia, paralysis of the lower face and of the tongue and larynx. Erb names elevation of temperature as a significant sign.

Deshusses[2] reports the case of a nineteen-year-old man, who, following an attack of unconsciousness, showed loss of sensation, contracture, conjugate deviation of the eyes, myosis, and increased respiration. The autopsy showed a diffuse meningeal hemorrhage over the bulb. Glasser[3] reports 19 cases of pontile hemorrhage. In only one case were convulsions noted. Kidney disease and alcoholism often stood in casual relationship. Leszynski[4] reports the case of a woman, aged fifty-five years, who had become suddenly ill with dizziness and vomiting. When he saw her, thirty minutes after the onset of her trouble, she was conscious. Her lower face on the right side was paralyzed and she exhibited a left hemiplegia and left ptosis. Both pupils were equal and contracted to 1 mm., and immobile. A few hours later coma developed, and the patient died twenty-three hours after the onset, having developed a temperature of 105° just before death. No autopsy was held. By far the most important recent paper on the subject of pontile hemorrhage and softening is that of C. L. Dana.[5] Dana believes, as the result of his own experience, that softening of the pons occurs more frequently than does hemorrhage. He himself, in his extremely valuable paper, reports 2 cases of hemorrhage and 9 of softening. He has collected 46 cases of hemorrhage with autopsies. Adding these to those collected by Bode and Larcher, Dana studied 190 cases. He concludes, from this study, that the more frequent causes of pontile hemorrhage are nephritis and arteriosclerosis. The arteries most frequently involved are the transverse and medium branches of the basilar.

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[1] Traité de médecine par Bouchard et Brissaud, p. 512.

[2] Gaz. hebd. de médecine, p. 695.

[3] Allg. Med. Central. Ztg., p. 1186.

[4] New York Med. Jour., 1897, lxv, 767.

[5] Medical Record, 1903, lxiv, 361.

Dana describes the symptomatology of pontile hemorrhage in these words:

"The patient has some prodromal headaches and malaise for a few days, with vertigo and sometimes vomiting. Then he falls suddenly, as if by a lightning stroke, into a coma, usually very profound. There are twitchings of the face or of the limbs, or both, but rarely any general convulsion (3 cases). The face is flushed, there is a fall of temperature, and the pulse is irregular, but not markedly increased or slowed; as a rule, the respiration is slow, 4 or 6 per minute, or more often irregular and of Cheyne-Stokes type. The pupils are contracted to a pin-point, and do not respond to light, but may be uneven. There is convergent strabismus or conjugate deviation of the eyes. The limbs are at first stiff, but may be relaxed later and the reflexes increased.

"The patient cannot be aroused, but can be made to vomit. A few hours later the temperature rises, sometimes very high—106° to 108°—but usually not. There are involuntary movements of the bowels, swallowing is impossible; evidences of dyspnœa are shown. The pulse becomes more rapid, cyanosis develops, and the patient dies in from six to twenty hours, usually with evidence of paralysis of respiration.

"If the hemorrhage is less severe, the coma is less profound or may be absent, the patient shows signs of agonizing suffering and difficulty in respiration, evidences of crossed paralysis, crossed anesthesia, and disturbance of equilibrium and ataxia can be noted."

Oddly enough, he makes no mention of double hemiplegia in this description. But in consideration of the structure of the pons, it will be readily seen that there may be either single or double hemiplegia, or crossed paralysis; or paralysis of the fifth, sixth, or seventh nerves may occur, depending upon the location and size of the hemorrhage.

Many of the symptoms of softening are the same as those resulting from hemorrhage, differing chiefly in the mode of onset, being slower and more irregular in development.

I may quote at this point one of my own cases of pontile softening which I published several years ago, and which raised a point that was suggested to me by Dr. Dana's first paper, viz., the differential diagnosis between pontile softening and opium poisoning, there being several striking features common to both—stupor, contracted pupils, irregular and slow respiration. There is much that is common in the symptomatology of pontile softening and pontile hemorrhage. To illustrate, I may refer to a case of pontile softening I reported several years ago: A woman, aged sixty-six years, slowly developed coma with twitching of the face and a temperature of 103°. She exhibited an external squint and immobile, pin-head pupils. The case was very similar to the one I report herewith; but because of the slowness of development, I made a diagnosis of softening rather than of hemorrhage of the pons.

The case is that of a woman aged sixty-three years. She was admitted to the Allegheny City Home, in 1871, on account of delirium tremens. She remained there several months. She was then twenty-nine years of age, and described as having been born in Germany, married and deserted. She had with her then a baby five months old and a daughter six years old. The latter was afterward admitted into the insane department.

For several years after her admission the patient was violent and troublesome in many ways, but for the past fifteen or twenty years she has been a model patient. Her condition was one of secondary dementia. She worked regularly, and for many years her physical health appeared good. She, therefore, has been an inmate of the Home continuously for thirty-four years.

On May 20 she had an attack of vomiting and purging, with some clouding of consciousness, but no paralysis. Her pulse was full, strong, and compressible, and about normal in rate. As the patient was an inordinate eater, the condition was believed to be due to acute indigestion; and she was ordered divided doses of calomel. But her condition grew rapidly worse, and on the morning of the next day she was unconscious. Her respirations were hurried and of a somewhat stertorous character.

In the afternoon of this day (21st), the patient was examined by Dr. Henninger and myself, who were visiting the institution with Dr. Allen, the resident physician. The case was now evidently one of apoplexy. In raising the arm and letting it fall, to determine which side was hemiplegic, there appeared very little difference on the two sides. Both arms fell in a limp fashion on several tests. It appeared, therefore, that there was double hemiplegia. The pupils were very small—about 1 mm.—equal, and immobile. The patient was profoundly unconscious and her respirations stertorous, about 20 to the minute. The axillary temperature was 99° F.

The diagnosis of pontile hemorrhage was ventured on the basis of these points: double hemiplegia, myosis, and the suddenness of onset with vomiting. She died about thirty hours after we saw her and without developing any new features.

About twenty hours after death an autopsy was performed by Drs. E. W. Willets, Geo. Wright, and Chas. W. Allen. The vessels at the base of the brain were discovered to be in a state of advanced degeneracy, being hard, tortuous, and calcified in many places. Over the entire area of the pons, beneath the pia mater and extending down over the oblongata for three-quarters of an inch, was a large, thick hemorrhage, firmly coagulated (see figure). The exits of all the cranial nerves from the third to the eleventh were involved in the clot.

The brain was removed and placed in a 5 per cent. solution of formaldehyde after the ventricles had been opened. A month later a section of the brain was made. The clot over the pons was shown to be about one-eighth of an inch thick. There was some hemorrhage under the pia and between the cerebellum and the cerebrum, which had probably come from the pontile hemorrhage. There was no hemorrhage in the interior of the pons. The exact source of the hemorrhage could not be ascertained, but it must have come from one of the vessels of the circle of Willis, or else—and most probably—from the basilar artery.

Photograph of a brain showing hemorrhage over the entire pons and the upper medulla oblongata.

Unfortunately, the specimen does not lend itself well to photography, and the hemorrhage is not so well shown in the accompanying photograph as I could wish.

CHORIO-EPITHELIOMA OF THE UTERUS.

REPORT OF A FATAL CASE, WITH OPERATION AND AUTOPSY.

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As the name implies, chorio-epithelioma is a growth which develops from the epithelium of the chorion. In its normal role this epithelium helps to form the blood sinuses of the placenta by eating through the walls of the capillary vessels in the decidua. During the development of the placenta, the chorionic cells, as a rule, penetrate the entire thickness of the decidua, and some of them may be found in the uterine muscle.

In chorio-epithelioma, the chorionic cells either have an increased power of penetration or there is a diminished resistance to the penetration, so that they invade the maternal tissues to a much greater extent than normally, producing widespread destruction at the placental site. Metastases, which exhibit all the characteristics of the parent growth, may occur to any of the visceral organs. It is a surprising fact, but one that is easily explained by the nature of the growth, that chorio-epithelioma is not always malignant. The ultimate result alone in a given case will determine the malignancy, even though it is impossible completely to extirpate the growth. In other words, given a case of chorio-epithelioma which has extended beyond the limits of a radical operation, the excision of the major part of it and the adoption of measures to increase the resisting power of the individual may result in the absorption of the extensions and the metastases. Pick has recorded a case illustrating this point, in which there was every indication of metastasis to the lung, and yet the patient completely recovered after removal of the primary lesion. The mortality in 124 cases recorded by Ladinsky was 50 per cent.

While chorio-epithelioma usually begins in the uterus at the point where the placenta is attached to the uterine wall, it may originate in chorionic tissue which has been transplanted by way of the blood channels to more or less remote parts. Primary chorio-epithelioma of the vagina has been reported. Chorio-epithelioma is sometimes apparently of embryonal origin—as, for example, in the case reported by Lubarsch in a girl aged twelve years, who had never menstruated, and in a testicular tumor by Schlagenhaufer, and in an ovarian cyst by Pick. In such cases some of the very early blastomeres which contain the elements producing the fetal envelop became displaced and subsequently developed.

The origination of a chorio-epithelioma which is not embryonal is probably in some way connected with the pathological physiology of placentation. Forty per cent. of chorio-epitheliomas are preceded by hydatidiform mole.

Recently it has been said that disease of the lutein tissue of the ovary may cause chorio-epithelioma and hydatidiform mole. This would bear out the hypothesis of Born and the experimental conclusion of Fraenkel, that the corpus luteum is the secreting part of the ovary and is intimately connected with the embedment and the nourishment of the fertilized ovum.

The facts about the present case which were of importance are as follows: (1) The history, which did not very clearly suggest the disease. (2) The delay in performing a second operation; this was unavoidable, but it probably led to the fatal result. (3) The widespread metastasis of the tumor without involvement of the spleen. (4) The absence of chorionic villi in the growth or in its metastases; which bears on its malignancy, for villi are said to be absent in the most malignant cases. (5) The cystic condition of the ovaries, in which, however, the lutein tissue was not involved. The case is as follows:

Gyn. No. 1433.—Admitted February 11, 1905. M. H., aged thirty-one years; married fourteen years; seven children.

Labors.—Normal, instruments not required; no lacerations; youngest child two years old.

Menstrual Flow.—First appearance at the age of twelve; always regular until one year ago; duration five days; never painful unless she caught cold; moderate in amount.

Last Period.—Indefinite.

Leukorrhœa.—Past three weeks, white discharge streaked with blood. Past week, dark red, foul odor.

Family History.—Father dead, cause unknown. Mother living, fairly good health.

General Previous History.—Diseases of childhood; otherwise negative.

Present Condition.—In August, 1903, she bore a child. Following the confinement the menstrual periods remained absent until November, 1904. During the first five months of this time she had been nursing her baby. November 25, 1904, she began to pass blood from the vagina. For a week this hemorrhage appeared to be a menstrual flow such as she had been accustomed to have; at the end of that time, however, the amount of blood lost was excessive, and she had severe pain in the lower abdomen, with increased hemorrhage whenever she moved about. On one occasion, feeling a strong desire to empty the bladder and attempting to do so, she passed about a quart of blood clots. For a week she went on bleeding and passing clots. She had bearing-down, labor-like pains in the lower abdomen. After this time the hemorrhage partially, but never fully, subsided. Walking or exertion would bring on a flow of blood. In December, after unusual exertion, she had chills and fever, and was obliged to go to bed for a period of three weeks. Subsequent to this attack she continued to have metrorrhagia upon the slightest provocation. Five days before admission the patient began to have a very foul vaginal discharge. The same day she suffered from a hemorrhage so severe that she was obliged to go to bed.

On Admission.—Temperature, 100.2°; pulse, 108; respirations, 28. Patient complains of "labor-like," bearing-down pains, associated with hemorrhage and foul, dirty red vaginal discharge.

General Examination.—Patient appears somewhat emaciated; skin and mucous membrane anemic. Examination of the chest is negative except for a blowing systolic heart murmur, which is evidently of hemic origin. Hemaglobin, 50 per cent. Urine normal.

Gynecologic Examination. Outlet parous; slight relaxation of perineum; cervix parous, soft; uterus size of three months pregnancy. Adnexa negative.

Operation February 13, 1905. Digital exploration of the endometrial cavity found it filled with a necrotic mass having a pedicle several fingers breadth in thickness attached to the left uterine cornu. Most of this tissue was removed piecemeal by means of the fingers and placental forceps. A portion of the pedicle remained attached to the uterine wall; this resisted slight efforts to detach it, and, as the uterine tissue was very soft, no further evacuation was made. The uterus was packed with gauze.

Histological Examination. The specimen shows irregular pieces of fibromuscular tissue, surrounded by pus and blood. Throughout the fibromuscular tissue are cells which occur either singly or in groups, some of them being small, about the size of the ordinary lymphoid cell; others are as much as ten times that size. The cells almost invariably show a distinct cell outline, and the protoplasm of the cell is large in proportion to the nucleus. This is true especially of the larger cells, many of them containing more than one nucleus and often as many as eight or nine. There are also masses very deeply stained, which appear like elongated nuclei, or like several nuclei bunched together, surrounding which either no cell body can be found or the cell body is extremely irregular. The muscular tissue is rich in blood channels, and the cells in question seem to show an especial tendency to penetrate into these channels, and in many cases they have done so. No chorionic villi are found. In some areas there are solid collections of cells which have all the appearance of Langhan's cells. These, with the irregular masses of protoplasm above described, justify the diagnosis of chorio-epithelioma.

After considerable persuasion the patient consented to a second operation. This was done on March 1, 1905. Panhysterectomy (Dr. Clark). The uterus was considerably enlarged. There was a purplish red nodule, the size of a pea, in the left broad ligament. There were no operative complications.

The *pathological report* of the specimen is as follows: Specimen consists of the uterus and adnexa removed by panhysterectomy (Fig. 1). The surface of the specimen is everywhere smooth and free of adhesions. The uterus is enlarged, measuring 13 cm. from portio to fundus. The fundus has a width of 8 cm.; the organ has been opened through the anterior wall. The uterine cavity measures 11 cm. in depth. The cervix is entirely normal. The endometrium for 2 cm. above the internal os appears somewhat thickened and œdematous in appearance. Above this point the endometrial cavity is occupied by a new growth, which has a smooth, regularly lobulated surface, yellowish gray in color, mottled with purplish red spots. Upon cutting through the mass at the fundus the surface of the section is purplish red, irregularly divided by interlacing bands of gray or reddish yellow; the purplish-red areas extend to and invade the inner layer of the myometrium. The grayish or yellowish-red bands, referred to above as interlacing irregularly throughout the purplish-red new growth, are apparently derived in part from the muscle of the uterine wall. At one point in the fundus the purplish-red growth has penetrated to within 8 mm. of the peritoneal surface. The greatest diameter of the wall of the uterine body is 2.5 cm.; this is at a point 4 cm. above the internal os. At the fundus the newgrowth almost everywhere extends to within 1.5 cm. of the peritoneal

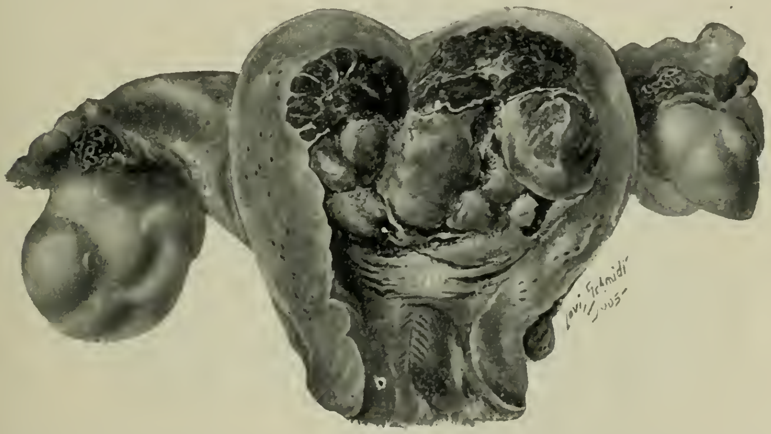

FIG. 1.—Chorio-epithelioma of the uterus. At the fundus on the left side the tumor (purplish red on section, very dark in the illustration) has penetrated to within 8 mm. of the serous coat of the uterus. Both ovaries are riddled with Graafian-follicle cysts.

surface. The right tube is 13 cm. in length and is entirely normal. The right ovary is enlarged (6 x 4.5 x 3 cm.). On section it is filled with cysts, which have a smooth lining and vary in diameter from 2 mm. to 2.5 cm. Some of these smaller cysts have a cherry-red color, and on section this color appears to be due to a hemorrhagic infiltration of the cyst lining. There is no luteum tissue which can be identified. The left tube and ovary closely resemble the adnexa of the right side. On the posterior surface of the right broad ligament, above the utero-ovarian ligament, 21 cm. to the right of the utero-ovarian anastomosis, is a nodule 8 mm. in diameter. It is hard and has a dark purplish-red color. It is not connected with any of the larger bloodvessels, so far as can be determined and, apparently lies free in the layers of the broad ligament.

Sections from the Fundus of the Uterus, Including the Newgrowth. The wall of the uterus is everywhere œdematous; toward the uterine cavity and some distance from the serous coat there is an infiltration, between the muscular bundles, of cells which occur singly and in groups. These cells vary in shape, size, and staining properties. Some of them are small, about the size of an ordinary lymphoid cell or slightly larger, while others are fully ten times this size. All of them can be distinctly outlined, and the amount of protoplasm in comparison to the size of the nucleus varies. Some of the larger cells have a relatively large amount of protoplasm, so that they appear more or less like squamous epithelium. Many of these large cells have more than one nucleus. There are also irregular masses of protoplasm, with elongated, irregular, and darkly stained nuclei seen throughout the tissue. The newgrowth seems to have special predilection for the bloodvessels. In some areas the cells are seen within the bloodvessels, while in others they form a part of the bloodvessel wall. They penetrate the myometrium in all directions; they occur in strings and bunches, and in no instance do they form gland-like spaces. There is little intercellular substance. Some of the cells closely resemble Langhan's cells. The muscular wall shows a dense inflammatory reaction. There are many broad areas of hemorrhage; this is especially marked and forms a very prominent feature of the histologic picture.

Sections from the Ovaries. The cysts referred to in the gross description, which had a cherry red color, proved to be Graafian follicle cysts, having extensive hemorrhages into the stroma beneath the granulosa cells. The ovary in general is somewhat œdematous. There is no evidence of any metastasis.

Sections from the Small Nodule in the Broad Ligament. This apparently is a vein to which metastasis has occurred. The vein is filled with blood which has begun to organize. The wall of the vein has been almost entirely destroyed by infiltrating cells which resemble the smaller ones found in the uterine newgrowth.

Until the fifth or sixth post-operative day convalescence was normal. At that time a persistent elevation of the temperature and of the pulse and respiratory rate led to an examination of the abdominal incision. This was in good condition. Several days later the patient complained of a slight cough and pain at the base of the right lung. Examination of the lung was negative. On the tenth post-operative day, because of the continuance of the above symptoms, a pelvic examination was made. An indurated area was found in the stump of the left broad ligament, which closely followed the pelvic wall to the brim of the pelvis. The patient's condition became progressively worse. On the eighteenth day there were subcrepitant rales at the bases of both lungs; on the twenty-second day the sputum became rusty. At this time a very loud, blowing, systolic murmur was present over the entire precardium. On the twenty-fifth day, with a temperature of 102°, a pulse of 150, and respirations of 36, she was removed to her home at her own request.

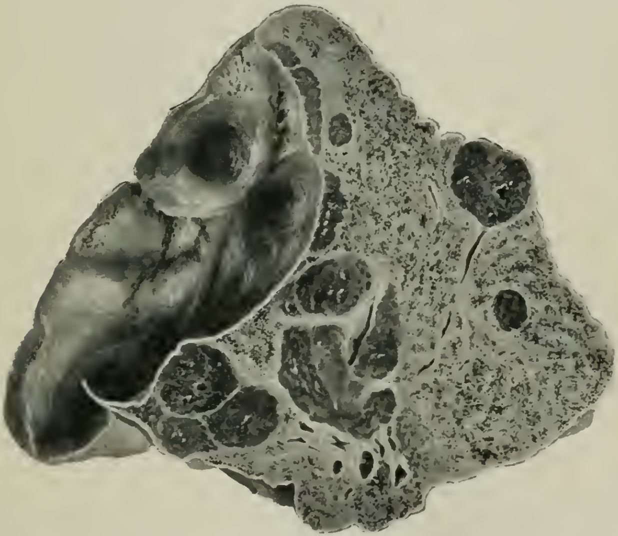

Fig. 2.—Metastases in the lung and pleura.

The patient died on the evening of April 5, about six weeks after the operation. An autopsy was performed on April 7.

Without going into minute details, some of the findings will be found of interest in connection with the clinical data already given. The body presented the emaciated and relaxed condition commonly seen in those dying from malignant growths, and the only specific evidence of the disease showing externally was a small, subcutaneous nodule in the left pectoral muscle about 2 cm. in diameter.

Internally, however, the metastases were very widespread, well-developed nodes being found in the following situations: Pelvic peritoneum, pelvic, lumbar, bronchial, and postperitoneal lymph nodes, right and left lungs, pleura, kidneys, liver, pancreas, and pectoral muscle (Figs. 2, 3, 4, and 5). (Permission was withheld for opening the cranium and spinal canal.) These nodules all presented very similar appearances; when small and newly formed they were rather sharply outlined, yellowish, and moderately firm, of about the consistency of normal splenic tissue, but when larger they were almost without exception round or slightly irregular, firm, meaty nodules, showing macroscopically a somewhat loose structure of fibrous tissue containing in its meshes a pulpy, dark red, friable material. These nodules were especially numerous and well developed in the lungs, which were extensively involved and partially collapsed by large

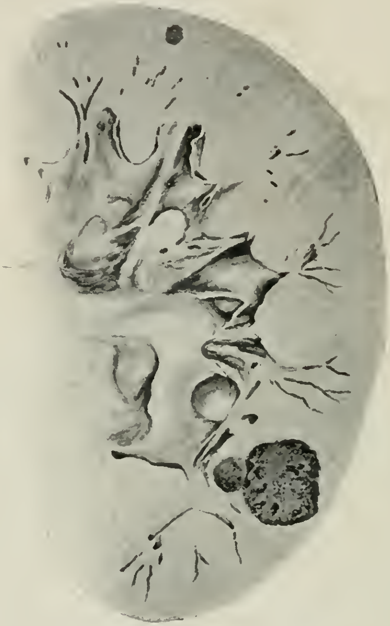

Fig. 3.—Metastases in the kidney.

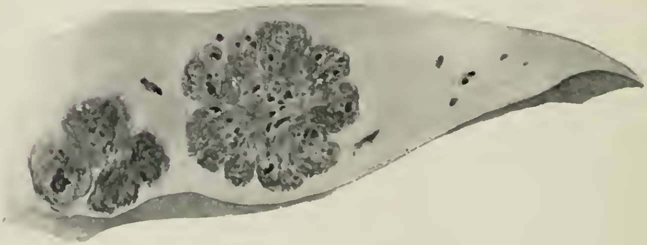

Fig. 4.—Metastases in the liver.

pleural effusions, especially on the left side, where a liter and a half of bloody turbid fluid was found. This lung and pleural involvement was evidently the immediate cause of death.

The tracing of the course of metastasis in this case was interesting. From the original growth the secondary lesions could be found next involving the pelvic peritoneum and lymph nodes, from which the chains of lymphatics could be directly traced to the liver by enlarged and involved nodes. In the liver the tumor cells, by their inherited function of eroding bloodvessels, had evidently entered the cava inferior; thence through the right heart they reached the lungs, and thence through the general circulation the other organs involved.

The microscopic study of sections prepared from this tumor was also of interest on account of the twofold peculiarity of certain of the cells of which they were composed. Both of these peculiarities can be looked upon as inherited tendencies transmitted from the original ancestral cells of the chorion. The first is the almost invariable presence of large hemorrhages in the tumor nodules, due to the penetration of the bloodvessels by the rapidly growing cells; the second is the formation of syncytial masses, due in the opinion of some authors, to nuclear multiplication without corresponding division of protoplasm, hence producing large protoplasmic bodies with many nuclei. Somewhat similar bodies are seen in many other forms of malignant growth, but in none so conspicuously and consistently as in this form of neoplasm. The tumor tissue is in general made up of masses of spindle-shaped cells of ovoid type, with here and there a syncytial mass, and wherever found the tumor cells always are infiltrative in the extreme. This is especially well shown in the primary growth in the uterus where the muscle bundles are greatly separated and infiltrated by the tumor cells.

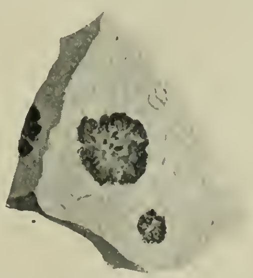

Fig. 5.—Metastases in the pancreas.

One especcially interesting feature shown by the microscope is the peculiar difficulty in determining in the liver the difference between tumor masses and chains of liver cells. It is plainly evident that at one portion of the field there is tumor and at another liver, but the dividing line is impossible to place. This condition of affairs is suggestive of the hypothesis that has been advanced that certain neoplasms may, in a tissue or organ, stimulate the parenchymatous cells to a sympathetic growth with the development of a new type of cell similar to that of the invading growth. Whether this can occur and whether there is in this an example of true metaplasia is questionable, and the exemplification found in this tumor is at most merely suggestive.

SPECIFIC IMMUNITY AND X-RAY THERAPEUTICS.[1]

By A. W. Crane, M.D.,
OF KALAMAZOO, MICHIGAN.

The medical mind believes in specifics, but distrusts a panacea. Quinine in malaria, mercury in syphilis, and iron in anemia are articles of faith in the therapeutic catechism. Diphtheria antitoxin cures diphtheria and nothing else. But the *x*-ray is put forth by its votaries as a treatment for a list of diseased conditions which are even less astounding for their number than for the wide diversity in their pathology and causes. However, the earnest testimony of many competent and reliable observers has compelled attention. But the question remains: How can a single agent be of service in such a bewildering variety of cases?

Some of the methods by which unaided nature is able to bring about recovery from infectious diseases have been disclosed and demonstrated in the last few years. We now understand that the presence of a minute quantity of infectious material within the body calls into play a wonderful set of protective processes. The blood serum is supplied with antibodies as various as the infectious agents, while the leukocytes, increasing in number and power, pour into the field, like an army of the interior, to engage in a life and death struggle with the invaders.

While the subject of antibodies is exceedingly complex, Wright has shown that the phagocytic power of the leukocyte, by which it is able to ingest and destroy bacteria, depends on certain antibodies in the serum which so injure the germs that they become an easy prey to the voracious white blood cell. He has called these antibodies opsonins. He also devised a method by which the blood serum, leukocytes, and any given bacteria may be brought in contact and kept at blood heat for fifteen minutes, after which cover glass preparations of the mixture can be stained and examined under the microscope. The average number of germs ingested per leukocyte, divided by the normal, gives the opsonic index.

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[1] Read at the annual meeting of the American Röntgen-ray Society, Cincinnati, October 1, 1907.

This opsonic index is an ascertainable factor in the natural specific immunity which follows recovery from an infectious disease. It also explains how an artificial immunity, no less specific, may be induced by hypodermatic injections, in proper doses, of the bacterial substance. The consideration of dosage is of importance in following the parallel which this paper indicates between opsonic and *x*-ray therapeutics. Too small a dose of bacterial substance fails to bring about a reaction. But it is truly astonishing to consider how small a proper dose is. 0.0025 mg. of the tubercle substance is the beginning dose. The protective forces of the body are delicately poised; otherwise they could not respond to such slight infections as may come through cuts and scratches, in time to prevent general infection. But, on the contrary, for the same reasons, too large a dose of bacterial substance overwhelms the immunizing forces of the system and plunges the patient into the so-called negative phase from which he may or may not recover. Doses must follow one another at right intervals, or else the reactions are cumulative and overwhelming on the one hand or isolated and ineffectual on the other. The proper dose and the correct interval can be ascertained only by repeated examinations of the blood. Clinical symptoms alone cannot furnish a guide, because the rise and fall of the opsonic index do not produce definite or uniform clinical symptoms.

Opsonic therapeutics has been conspicuously successful in certain diseases which have also been treated with equally conspicuous success by the *x*-rays. Examples of such diseases are lupus, acne, and glandular tuberculosis. In looking over the long list of diseases treated by the *x*-rays, it will be noticed that the large majority are either diseases known to be parasitic, or diseases running such a course that analogy compels us to believe in a microbic cause yet undiscovered. The antiseptic power of the *x*-rays being a negligible quantity, it has occurred simultaneously to many *x*-ray workers in various parts of the world, myself included, that the therapeutic properties of the rays might lie in some power to stimulate the production of opsonins in general in the body fluids. With this idea in mind, I made cultures from several pustules in a case of acne of the face about to be treated, and found that the infectious agent was the common Staphylococcus pyogenes albus. I then made an estimate of the patient's opsonic index to this germ, after which *x*-ray treatments were begun.

One observes from the chart of this case (Fig. 1) that the opsonic index was low before treatment, the average number of germs per leukocyte being 1 and the percentage of active leukocytes being 62.[2] An *x*-ray exposure of fifteen minutes at a distance of six inches was given. On the next day the average number of bacteria per leukocyte had risen to 1.42 and the active leukocytes to 70 per cent. On the third day the number of germs per cell had increased 300 per cent. and the number of active leukocytes had increased 17 per cent. Then, on the fourth day we found a slight fall, so that when the patient appeared on the fifth day, we gave a second treatment like the first, all parts except the affected area being, as usual, carefully screened by lead foil. On the day of this second treatment the average number of bacteria per leukocyte was 2.20, and the percentage of active leukocytes 70; but on the next day the figures were 3.18 and 92 per cent., and on the day following, which was the seventh day from the beginning treatment, the figures stood 5.20 and 96 per cent.; and on the eighth day, 8.70 and 100 per cent. of active leukocytes. On the ninth day the figures were 8.76 and 100 per cent., or an increase in phagocytic power of 876 per cent. over the beginning figure. The patient's face had completely cleared. Only brownish discolorations remained where the pustules had been. The patient had acquired, by some action of the *x*-rays, a specific immunity to Staphylococcus pyogenes albus.

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[2] All opsonic estimations were made with a serum dilution of 1 to 20.

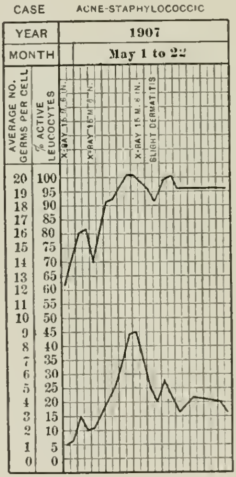


FIG. 1.—Upper curve = percentage of active leukocytes. Lower curve = average number of bacteria per cell.

On the tenth day, in obedience to an opsonic fall, we gave a third treatment. But there was no longer an acne to treat, and it is significant to note that the average number of bacteria per leukocyte declined to about 4 and the percentage of active leukocytes to about 96, where they remained as normal constants. The patient remains well up to date, and it is safe to predict that so long as his specific immunity endures he will be free from staphylococcic acne.

During the treatment of this case we made several estimations of the opsonic index to the tubercle bacillus, but we found that even at the height of the staphylococcic reaction the tuberculo-opsonic index remained unchanged.

The next case was one of lupus of the face, a small ulcer an inch in diameter on the temple (Fig. 2).

One observes a prompt rise after each treatment until the fourth, when there is a general decline until the seventh, when a rise again occurs. During this prolonged negative phase the lupus ulcer remained stationary, but with the upward swing of the opsonic index there occurred a rapid shrinking of the patch. With more experience on my part I could have regulated the *x*-ray dosage in more accurate accordance with the blood findings. As it was, the falling index restrained me from pushing the *x*-ray treatments as would usually be done when no dermatitis or skin reaction showed. Had the treatments been pushed, it is my opinion that the ulceration, which had been present ten years, would never have healed, but would have been classed as one of the inexplicable cases not amenable to *x*-ray treatment. After the fourth treatment I should have waited several weeks, if necessary, until some slight opsonic reaction occurred, and then, by smaller doses, should have nursed one small reaction after another, until a fair degree of immunity had been obtained. It is quite possible that in such cases we should

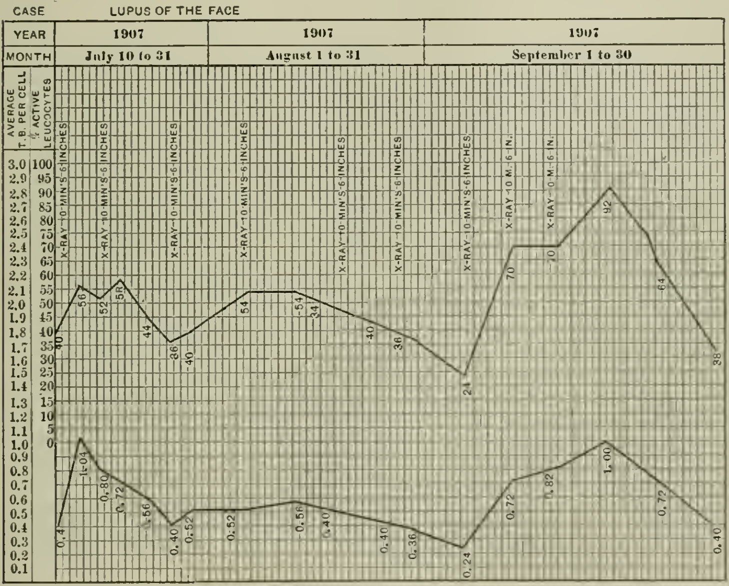
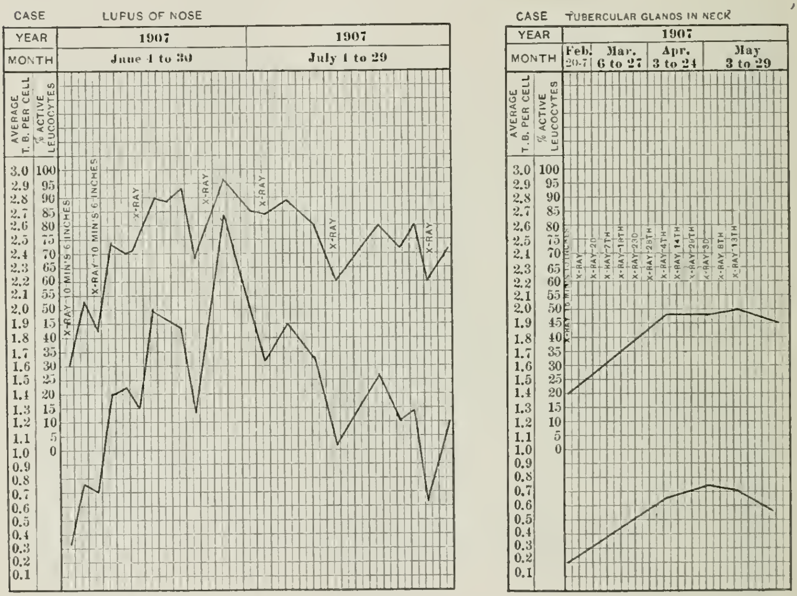


FIG. 2.—Upper curve = percentage of active leukocytes. Lower curve = average number of bacteria per cell.

be satisfied with a very moderate index, because, when the protective forces are feeble, the induction of high indices might easily lead to the exhaustion of the opsonin producing tissues, with the sudden relapse of the case, as *x*-ray operators sometimes see, without being able to furnish any adequate explanation.

The most striking case I have to offer is one of lupus of the nose. Seven *x*-ray treatments were given (Fig. 3). One sees that the tuberculo-opsonic index was low in the beginning. After each *x*-ray treatment there was a prompt jump in the index, until after the fourth treatment (twenty-two days from the beginning), the average number of tubercle bacilli per leukocyte had increased nearly seven and one-half times, and the active leukocytes had increased from 30 to 96 per cent. The lupus patch had healed, and from this time on the index gradually declined in spite of *x*-ray treatments.



Figs. 3 and 4.—Upper curve = percentage of active leukocytes. Lower curve = average number of bacteria per cell.

Although I have been giving *x*-ray treatments from the first years of its employment as a therapeutic agent, I never before obtained such successful results with so few treatments and in so short a time. By analogy with our opsonic work I should attribute these results to the careful timing of the treatments. The opsonic estimations enabled us to give each treatment just as the positive phase began to decline.

The last case was one of tuberculous glands in the neck of a boy aged ten years. The patient had seven x-ray treatments before the opsonic estimations were begun (Fig. 4). One notices that the beginning figures are very low, but that under x-ray treatments a steady rise in the tuberculo-opsonic index is produced from February 20 until May 1, when a moderate fall occurs. By May 1, however, the glandular enlargements had disappeared, inasmuch as what was left were two very small, hard nodules representing the permanent remains familiar to x-ray therapeutists. The moderate degree of immunity obtained in this case is sufficient, and the patient remains free from tuberculosis.

In all these cases we see that the x-rays ceased to raise the index when the infectious agent was presumably eliminated; and furthermore that the index is raised only for germs present in the lesion. That is to say, the x-rays do not appear to stimulate the production of opsonins for bacteria in general, but only for those in living tissues brought directly under their influence. The charts of opsonic indices during x-ray treatments and the charts during opsonic vaccinations are similar in all essential particulars. The time of reaction after therapeutic application; the succession of negative and positive phases; the interval required between treatments, would seem to be too closely parallel to be accidental. The concomitant variations seem to prove a common cause; and the common cause seems to be the liberation, in the body fluids, of the immunizing substance of the disease-producing agent.

This is what is done in opsonic practice, and this is what the x-rays seem to do at the site of exposure. These principles, if they hold at all, will hold as well for cancer as for tuberculosis. In fact, if applicable, they must apply to all cases in which there is pathological material to which the body may react. Thus may we explain the tremendous negative phase which so often occurs after exposure of sarcoma to the x-rays. Equally well may we explain why we sometimes fail to cure in forty treatments the same sort of case that in another patient we cure in ten. That is to say, if our hypotheses are correct, we may, in one case, owing to the individual reaction from too frequent or too severe exposures, easily throw the patient into a succession of negative phases which prevent recovery. Or, in another case, we may fail, by too weak exposures, to liberate the immunizing substances; in which case frequency of exposures will not avail.

If I am permitted to draw conclusions from my limited data, I should suggest:

1. That all x-ray treatments, to be effectual, may require a degree of intensity sufficient to set free in the tissues what is equivalent to an autogenous vaccination.
2. That the duration of the exposure and the extent of the diseased tissue exposed should be so regulated as to induce either a small negative phase or none at all.

3. That the repetition of exposures, as far as possible, should be governed by the duration of the negative and positive phases; and that in diseases of which the disease-producing agent is as yet undetermined, one should be governed by analogy with those cases in which opsonic estimations can be made.

It follows as a corollary that it is not necessary to expose the whole area in order to bring about complete recovery, and that exposure should not, as a rule, be repeated oftener than twice a week, and probably usually at less frequent intervals, to get the maximum results and to avoid prolonged or incurable negative phases. It is also increasingly necessary to measure our *x*-ray dosage. In this respect *x*-ray therapeutics is lacking in precision. No method has yet been made practicable by which we may exactly specify the quality and quantity of the *x*-ray dose.

The advantage of *x*-ray treatments over opsonic therapeutics is considerable:

1. The immunizing substance set free under the influence of the *x*-rays is of necessity autogenous; that is, it is formed from the actual microbic strain which is producing the disease. One has only to read Wright's articles to learn how important it is in opsonic practice to use a vaccine made of the bacteria from the patient rather than from a stock culture.

2. Many of the difficulties and mistakes incident to a bacteriological diagnosis are eliminated.

3. In cases in which the bacteriological cause is as yet undetermined, or in which the disease-producing agents are not bacteria, the *x*-rays are nevertheless applicable.

In conclusion, I must state I am well aware that I have carried my deductions and conclusions far beyond the limits warranted by the number of cases I have to report. My excuse is, to set the subject, along with obvious hypotheses, squarely before the profession, in the hope that other workers may be invited into what has seemed to me a fertile field of therapeutic endeavor.

REVIEWS.

A TEXT-BOOK OF PHARMACOLOGY. By TORALD SOLLMAN, M.D., Professor of Pharmacology and Materia Medica in the Medical Department of the Western Reserve University, Cleveland, Ohio. Second edition; pp. 1070; 127 illustrations. Philadelphia and London: W. B. Saunders Company, 1906.

A PRACTICAL TREATISE ON MATERIA MEDICA AND THERAPEUTICS. By JOHN V. SHOEMAKER, M.D., LL.D., Professor of Materia Medica, Pharmacology, Therapeutics, and Clinical Medicine in the Medico-Chirurgical College, Philadelphia. Sixth edition; pp. 1255. Philadelphia: F. A. Davis Company, 1906.

MATERIA MEDICA AND THERAPEUTICS. By J. MITCHELL BRUCE, M.A., LL.D., M.D., Consulting Physician to the Charing Cross Hospital, London. Revised edition; pp. 632. Chicago: W. T. Keener & Co., 1906.

A TREATISE ON MATERIA MEDICA AND THERAPEUTICS. By RAKHALDAS GHOSH, L.M.S. (Cal. Univ.), Lecturer on Materia Medica in the Calcutta Medical School, Calcutta, India. Edited by C. P. LUKIS, M.D., Dean of the Faculty of Medicine of the University of Calcutta. Third edition; pp. 737. Calcutta: Hilton & Co., 1906.

MATERIA MEDICA, THERAPEUTICS, PHARMACOLOGY, AND PHARMACOGNOSY. By WILLIAM SCHLEIF, Ph.G., M.D., Demonstrator of Medical Pharmacy in the University of Pennsylvania. Third edition; pp. 470. Philadelphia and New York: Lea Brothers & Co., 1907.

A MANUAL OF MEDICAL TREATMENT OR CLINICAL THERAPEUTICS. By I. BURNEY YEO, M.D., F.R.C.P., Emeritus Professor of Medicine in King's College, London. Fourteenth edition; 2 volumes, pp. 696, 818. Chicago: W. T. Keener & Co., 1906.

IT is said by Ghosh that "materia medica is not an attractive subject, but it must be learnt." That the necessary labor is great no one doubts who has picked his way through its mazes; but he that desires a trustworthy guide to its devious ways may have recourse confidently to the aforementioned books—all of which are new editions of well-known volumes, and have been revised to accord with the new Pharmacopœia.

Sollman's *Pharmacology,* which comprises not only pharmacology, but also therapeutics, materia medica, pharmacy, prescription writing, toxicology, outlines for laboratory work, etc., has been thoroughly revised, in large part rewritten, and considerably enlarged. The revision has been thorough, as is apparent on almost every page and in the many references to very recent research and other work. The classification of drugs adopted is somewhat unusual, but the descriptions of the actions of drugs are very good, albeit more from the point of view of pharmacology than of therapeutics. Especial attention has been given to the section on laboratory work—which has been much amplified. Since pharmacology nowadays is taught largely as a laboratory exercise, the systematized course outlined in the book, which includes a description of technique and apparatus, should prove of much value to the teacher as well as the student; to make it as practical and adaptable as possible, it has been made quite distinct from the text, to which, however, it should be considered introductory. Proprietary remedies are discussed in a sane manner. Quite an unusual amount of space is devoted to toxicology, but the section is excellent, dealing with symptoms, etiology, isolation, and treatment of poisoning, while the symptoms and treatment are also discussed under the heading of each drug. The incorporation of bibliographical references must be mentioned as another useful addition. The weakest point in the book consists of the references to therapeutics. Although this might be deemed excusable, in view of the wealth of information on other topics, the rather slighting references to the therapeutics of important drugs, such as arsenic, iron, digitalis, opium, etc., cannot escape comment, and some of the therapeutic recommendations are at least subject to debate; but the very worthy endeavor has been made throughout to base therapeutics on the results of pharmacological research. On the whole the book is excellent, and will well repay perusal by the student, teacher, and practitioner interested in pharmacology and allied subjects.

Shoemaker's *Materia Medica and Therapeutics,* now in its sixth edition, has been before the medical public for a long time, and has served a very useful purpose. The new edition does not differ in general arrangement from its predecessors; but the book has been carefully revised and enlarged by about 100 pages; a new section dealing with general considerations concerning remedies and systems of therapeutics has been added; and discussions of the therapeutics of new agents, such as the Röntgen rays, the Finsen light, serumtherapy, animal extracts, vibrotherapy, hydrotherapy, etc., have been introduced. The book doubtless will continue to maintain its well-established reputation.

Bruce's *Materia Medica and Therapeutics* is one of the best books on the subject, but it needs not the reviewer's words to establish the fact, since the publication of 49,000 copies since 1884 amply attests it. The book is small, which is in many respects an advantage;

the arrangement is much to be commended, and the treatment of the subject matter is all that could be desired. The different drugs are considered under the headings of immediate local actions and uses, actions on the blood, specific actions and uses, remote local actions and uses, and the uses of the different preparations, all of which must appeal to the student. The last section in the book—on general therapeutics—has long impressed the reviewer as one of the most valuable in any book. Taking up the systems of organs in order, Dr. Bruce discusses physiological relations, pharmacodynamics, pathological relations, natural prevention and recovery, and therapeutics. All of this is much condensed, but it is readable, sound, and very practical. Though the book may be considered a trifle out of date in some places, happy were most of us if we knew all that it contains. The present edition has been adapted to the United States Pharmacopœia by Oscar Oldberg.

Ghosh's *Materia Medica and Therapeutics* is an excellent book, thoroughly adapted to the purpose in view. However, since it does not differ materially from, nor is it superior to, other books on the same subject, there is little likelihood that it will displace them in this country; but it might be used with advantage in conjunction with them. The "prescribing hints" appended to the descriptions of important drugs are an especially attractive feature; they suggest the best ways of administering drugs so as to make them most palatable as well as most efficacious.

Schleif's *Materia Medica, Therapeutics, Pharmacology, and Pharmacognosy* has firmly established for itself a reputation as an excellent book for the student and junior practitioner. It comprises not only a discussion of the physical properties, physiological action, therapeutics, and toxicology of each medicinal agent, but also chapters on prescription writing, medical Latin, medical pharmacy, practical anesthesia, tables of doses, of poisons and antidotes, and of incompatibilities, and a therapeutic index of diseases and remedies. The new edition has been thoroughly revised, metric equivalents have been introduced throughout, references to sixty new drugs have been included, and the book has been increased in size by about 100 pages. The book has been considerably enhanced in value, and continues to merit the confidence of students and teachers.

Yeo's *Medical Treatment* is a book conspicuously devoted to treatment. Materia medica, as such, is not discussed, although the different means of treatment are mentioned in sufficient detail as occasion warrants, and many of the sections are enlivened by more or less discussion of symptoms which, though scarcely germane to the subject, serves the very useful and practical purpose of enabling the author to suggest valuable hints in treatment looking toward not only the cure of the disease, but also the alleviation of symptoms. Most of the treatment suggested is excellent, being born of a wide experience, and it can be safely adopted with assurance of happy results; some of it may be looked upon as old fashioned by the eager and alert young physician; a little of it runs counter to the practice of the most progressive physicans of this country. Doubtless we should not expect encomiums of the Brand treatment of typhoid fever, since it has not been thoroughly tried in England, but at this day scarcely anyone except Dr. Yeo believes in the efficacy of chlorine water. The advocacy of no haste in resorting to paracentesis in pleuritis is not in accord with the best modern practice. The absence of specific reference to hyperchlorhydria, achylia gastrica, and gastroptosis seems worthy of comment, as does also Dr. Yeo's marked discountenance of operation in all cases of appendicitis. However, 22,000 copies issued attest the practical usefulness of the book, and speak more than words of its value to many practitioners. Oscar Oldberg has adapted the present edition to the standard of strength of preparations employed in America. A. K.

American Practice of Surgery. Edited by Joseph D. Bryant, M.D., and Albert H. Buck, M.D., of New York City. In eight volumes. Vol. III, pp. 775, with 311 illustrations. New York: William Wood & Co., 1907.

In the third volume of the *American Practice of Surgery* is begun the study of the various systems of the body, that of the bony skeleton being first discussed. There are prefixed, however, as Part XI, two articles which properly belong in an earlier volume, and which logically should follow close upon the inflammatory process. These are treatises on poisoned wounds, by Major Charles F. Mason, U. S. A., and on rabies, by Dr. George G. Rambaud, of New York. Under the former heading are included such diseases as glanders, anthrax, tetanus, malignant œdema, etc., all of which have been discussed—many of them twice—in Volume II. The subscribers would have just cause for complaint in this apparent "padding," did not the thought arise that the editors, recognizing the deficiencies in some of the earlier articles, are now endeavoring to make amends; but the accounts already given of glanders, anthrax, and similar diseases need no supplement; and it is to be regretted that Major Mason could not have written the only account of such affections as erysipelas, tetanus, malignant œdema, etc., since even the terse descriptions he here furnishes are evidence of ability for greater things.

Rambaud's article on rabies is what might have been expected from his pen: being the director of the Pasteur Institute, it is but natural that he should advocate prophylactic inoculation, and that his views of the pathology of the disease should be tinctured by those of Pasteur himself. He denies the specificity of the Negri bodies, and maintains that the cause is not a protozoon, but an extremely minute bacterium. It is, on the whole, a temperate account of rabies, and parties on both extremes would do well, we think, to remember the Horatian motto: "*Est modus in rebus.*"

Part XII includes fractures, by Duncan Eve, of Nashville; pseudarthrosis, by T. Turner Thomas, of Philadelphia; inflammatory affections of bone, by Peters, of Toronto, whose recent death will be widely regretted; non-inflammatory affections of bones, by Roswell Park; syphilitic disease of the bones, by Horsley, of Richmond; and tumors originating in bone, by Simmons, of Boston. Part XIII, diseases and injuries of joints, includes chronic non-tuberculous and non-traumatic inflammations of joints, by Charles F. Painter, of Boston; tuberculous disease of the bones and joints, by Alexander Primrose, of Toronto; and wounds of joints, by John Chadwick Oliver, of Cincinnati.

In the whole surgery of the osseous system, two articles are conspicuous by merit—those on pseudarthrosis and on tuberculous disease of the bones and joints. The article of fractures is distinctly disappointing. What little progress has been made in the pathology, diagnosis, and treatment of fractures within the last generation is owing almost entirely to the Röntgen-rays and the results of operative experience; and good results are to be obtained in this important branch of surgery only by strict attention to minute details. In the latter the present article is in our judgment deficient; and in regard to the former it can only be said that the illustrations employed are most of them hallowed by age, and, what by no means follows as a corollary, they are mostly bad illustrations, from both an artistic and a scientific point of view. That fractures of the elbow "nearly always justify" the use of ether for diagnosis we do not admit; and although, with apologies to the King's English, it may be that while the patient is under the influence of this drug "it likely will be possible" to make a correct diagnosis and to reduce the fracture, we consider a resort to etherization, except under very exceptional circumstances, rather a confession of incompetence on the surgeon's part than a proof of the complicated nature of the fracture. That fractures of the carpus are rare has been disproved by the studies of Dr. G. G. Ross, of this city; and that padding to preserve the interosseous space in the forearm is either necessary or desirable we do not believe. The account of fracture of the femoral neck is antiquated, and the tables showing the differential diagnosis between intracapsular and extracapsular fractures could well have been omitted, since modern study has shown that such a differentiation is immaterial because practically all such fractures are partly intracapsular and partly extracapsular. The reference to the so-called "Maxwell treatment" by lateral traction reminds the reviewer that this method was accurately described and illustrated by Dr. G. W. Phillips, of Illinois, in the pages of this JOURNAL in 1869 (vol. lviii, p. 398). The description of fractures of the shaft of the femur is distressingly inadequate, and twice the space is devoted to fratures of the patella. Philadelphia surgeons will miss all references to the fracture box.

Dr. Thomas's article on pseudarthrosis is one of the best in the volume—orderly, concise, and sufficiently encyclopedic. Should any criticism be offered, it is perhaps in the choice of title, since the pathological condition he is describing very rarely constitutes a true false joint; ununited fracture is a more accurate designation, and we would prefer to reserve the term pseudarthrosis for those rare cases in which a bursa has formed between the ends of the fractured bones. Possibly a little more stress might have been laid on failure properly to immobilize the fragments as a cause of non-union, and on the value of massage in arousing osteogenetic processes when prolonged immobilization fails to produce union. Thomas shows a marked preference for the Parkhill clamps. It is a pity that no description of operative technique is included; in our own opinion the difficulty of these operations consists in the surgeon's failure to provide a proper armamentarium. The use of chromic-gut bone sutures is not mentioned; yet Macewen, certainly a past-master in bone surgery, uses no others. And to prevent the necessity of removing wire sutures later, it is not sufficient merely to "press" the twisted ends against the bone—they should be hammered into the bone, so as to ensure their being covered by the periosteum. But even with these few exceptions, the present article on ununited fractures is as judicious, straightforward, and modern an account of the condition as any known to the reviewer.

Dr. Peters's description of inflammatory affections of bone is a valuable contribution to the subject, the sections on etiology and pathology being particularly praiseworthy. In regard to treatment, Dr. Peters seems a little too timid in advising operations in acute osteomyelitis. He thinks two trephine holes at the extremities of the long bone affected afford sufficient opening, and that irrigation from one to the other will be sufficient. He discountenances operations of *évidement*, or guttering, as he calls it, and is perhaps over-cautious in resort to Mosetig-Moorhof's bone-filling. We believe ourselves that the patient's life is frequently jeopardized by the timidity of a surgeon, not only in failing to remove all the diseased bone, but in leaving behind overhanging edges of bone which if left will materially hinder the granulation of the wound, as well as tend to the production of new sequestra. In chronic inflammatory diseases of bone of non-tuberculous type, the iodoform-wax filling deserves to be more used in this country than has hitherto been the case.

Roswell Park, in treating of non-inflammatory diseases of bone, has probably the most difficult subject in the whole volume. He excludes the terms "rheumatism" and "rheumatic" from any connection with bones and their diseases; and does not attempt even a sketch of treatment. The whole article is a rather desultory disquisition on the nature of the non-inflammatory affections of bone.

Tumors originating in bone are discussed by Dr. Simmons. The same problems as to classification and terminology arise here that perplexed the reader in the first volume. Referring to exostoses of the accessory sinuses, Simmons states that Virchow termed them *endostomata*. The great master of pathology would have been grieved to see himself inaccurately quoted, and in a way which only adds confusion to the nomenclature of tumors. Virchow described this condition as endostosis—a term analogous to exostosis. Endosteoma, referring to bony tumors arising in the centre of a bone, would be better than endostoma, although the latter is found in dictionaries.

Painter, in discussing non-tuberculous inflammations of joints, adopts the classification of Goldthwait, which, although sufficient for a working hypothesis, is not scientifically accurate. In this classification these diseases are divided into: (1) Infectious; (2) atrophic; and (3) hypertrophic; the first being based on the etiology, while the second and third are based on the pathology of the disease. The classification proposed by Nathans is more logical, in that under the terms infectious and metabolic all joint diseases are classed according to etiology. In spite of the limitations of our knowledge, Painter has prepared a very lucid account of these diseases, and one which shows how further progress may be attained. This is all that can be expected, and the author is to be sincerely congratulated on his work. One egregious error, however, should not have escaped detection: it is that of referring in the text to skiagrams of a hemophilic elbow as taken from "a young man," when a glance at the illustrations (Figs. 245 and 246) shows the elbow actually figured to have been one of a child certainly under six years of age.

Without any doubt the best article in this volume is that on tuberculosis of the bones and joints, by Primrose. It is too long for us to analyze, and we can only regret that Pott's disease of the spine has not been included. It is gratifying to realize that surgery has so far progressed that excisions of the larger joints for tuberculosis are now becoming rare operations. As in many other departments of surgery, real progress in bone surgery is slow; but we have long passed the time when amputation was the only remedy short of death; we are now seeing excision pass; and when we get enough roof-gardens and country branches for our hospitals, patients with tuberculous bone disease will get well without operation.

A. P. C. A.

PROGRESSIVE MEDICINE. A QUARTERLY DIGEST OF ADVANCES, DISCOVERIES, AND IMPROVEMENTS IN THE MEDICAL AND SURGICAL SCIENCES. Edited by HOBART AMORY HARE, M.D., Professor of Therapeutics and Materia Medica in the Jefferson Medical College. Assisted by H. R. M. LANDIS, M.D., Demonstrator of Clinical Medicine in the Jefferson Medical College, Philadelphia. Vol. IV, December, 1907; pp. 336. Philadelphia and New York: Lea Brothers & Co., 1907.

VOL. IV of the series for 1907 of *Progressive Medicine* opens with a critical discussion of recent advances in diseases of the digestive tract and allied organs, the liver and the pancreas, by J. Dutton Steele. The most important contributions consist of the normal and morbid physiology of the digestive tract, the action of alcohol on the stomach, the morbid physiology of visceral pain, facts about digestive ferments, gastric carcinoma, gastric ulcer, chronic auto-intoxication of intestinal origin, the determining the total amount of fecal bacteria by weight, the value of intestinal antiseptics, true intestinal dyspepsia, infections of the biliary tract, cholecystitis, cholelithiasis, chronic icterus, and acute necrosis and hemorrhage of the pancreas. These comprise 95 pages of exceedingly useful information, well digested, clearly epitomized, and interestingly presented. Dr. John Rose Bradford discusses diseases of the kidneys—22 pages. Among other topics, the following are critically discussed: Hydronephrosis, renal tumors in children, arteriosclerosis of the renal arteries, increased arterial tension and renal disease, experimental arterial degeneration, renal extracts, renal hematuria, the functional activity of the kidney, and hydremia. Dr. Joseph C. Bloodgood contributes a chapter of 90 pages on the surgery of the extremities, fractures, dislocations, tumors, surgery of the joints, shock, anesthesia, and infections. Among the many important subjects discussed are scopolamine-morphine narcosis, spinal anesthesia, Bier's passive hyperemia treatment, divers diseases of the bones and joints, and the very important subject of tumors—the last mentioned being well illustrated. Dr. William T. Belfield contributes a chapter of 31 pages on genito-urinary diseases, discussing, among other topics, hematuria, renal pain, nephritis caused by surgical lesions, ureteral occlusion, ulceration and carcinoma of the bladder, enlargement of the prostate, tumors and other enlargements of the testicle, and gonorrhœa. Finally, Dr. H. R. M. Landis contributes an extremely valuable and interesting chapter on recent progress in therapeutics—69 pages—which, to be properly appraised, must be read. Altogether, the volume is a valuable member of an exceedingly valuable series—a virtual necessity in these days of rapid progress. Assuredly, nowhere else are progress and advances in medicine better or more promptly recorded. A. K.

Diseases of the Lungs. By Robert H. Babcock, A.M., M.D., Recently Professor of Clinical Medicine and Diseases of the Chest, College of Physicians and Surgeons, Chicago, Illinois. Pp. 809; 12 colored plates and 104 text illustrations. New York and London: D. Appleton & Co., 1907.

Dr. Babcock's *Diseases of the Lungs* is designed to be a practical presentation of the subject for the use of students and practitioners of medicine, and is issued as a companion volume to his well-known book on diseases of the heart and arterial system, published in 1903. The arrangement of the book is that which is quite familiar. The first 68 pages are devoted to the different forms of bronchitis, the etiology, diagnosis, and treatment being discussed in quite satisfactory detail. The chapter on bronchiectatsis, reflecting largely the opinions of Carr, Marfan, Hoffmann, and Lenhartz, but also the author's personal experience, is of much interest; but some reference might have been made to the postural treatment, undoubtedly of much service. A special chapter (28 pages) is devoted to pulmonary hemorrhage. The discussion of the causes, which include the influence of the nervous system, is very good. The most efficient means for the arrest of profuse hemorrhage is said to be atropine sulphate, $\frac{1}{50}$ to $\frac{1}{25}$ grain hypodermically. The advantages of morphine also are pointed out. Nitroglycerin is not recommended, on account of its initial action in quickening the heart's action and the consequent possibility of a thrombus being dislodged; but assuredly it has the effect claimed for atropine—that of reducing the pulmonary blood pressure by causing vasodilatation in the systemic circulation, and its use has been attended by good results clinically. The use of ergot and drugs of like action is rightly condemned.

In reviewing a book on diseases of the lungs one instinctively turns to the sections on pneumonia and tuberculosis. To pneumonia Dr. Babcock devotes 128 pages; to broncho-pneumonia, 31 pages; and to tuberculosis, 215 pages. His views with regard to the etiology of pneumonia are sound, the disease being looked upon as an infection, and the influence of cold being said to be to impair or destroy the protective power of the bronchial or pulmonary epithelium by occasioning some chemical or biological change in the cells by virtue of which the pneumococcus is enabled to find suitable soil for its growth. The chapters on the symptomatology, the physical signs, and the clinical varieties are excellent. The treatment recommended is what is generally known as the expectant, which is very well outlined. He suggests that the high mortality of the disease in hospitals is due to lack of hygienic conditions, especially lack of fresh air; he recommends that the air supplied to the lungs should be as pure and cool as possible, and that if necessary the nurses wear warm wraps or keep a fire in the grate, if there be one. He believes that even a draught is less dangerous than lack of proper ventilation; that nothing is more absurd than to see an oxygen apparatus in a room the windows and doors of which are closed and the atmosphere stifling from heat and foul emanations from the patient and attendants; and that the cotton jacket is an abomination, a relic of ignorance, and a device calculated to prevent radiation of body heat, to augment the sufferer's discomfort, to retain sour-smelling sweat, and to interfere with and, hence, occasion neglect of those frequent chest examinations without which one cannot keep track of the progress of the disease. The use of veratrum viride and aconite is condemned; cold is said to be the best antipyretic; digitalis is recommended as a heart tonic; and it is said that alcohol may do good if the pulse begins to grow in frequency and the heart sounds to become weak, short, and perhaps impure, while cyanosis is not very widespread and intense and pulse-tension has not yet fallen to a noticeably low ebb, but that it is theoretically contraindicated if cyanosis of a more than usually pronounced type precedes the acceleration and enfeeblement of the pulse. There are other equally sound views.

The chapters on tuberculosis are excellent; perhaps the best in the book. Emphasis is laid on the idea of the disease being due to infection rather than to hereditary influence; the symptomatology and physical signs are well described; every one might read with profit the chapter on diagnosis; and the chapters on prevention and treatment contain all that is modern. There is an interesting though short chapter on pulmonary syphilis.

The chapters on diseases of the pleura suffer somewhat by condensation, only 70 pages being devoted to them. What there is, however, is very good. Examples of the author's progressiveness are found in the statement that he regards all so-called primary pleurisies as due to the tubercle bacillus or the pneumococcus, to the tubercle bacillus if the exudate be serofibrinous, until proved otherwise; and in the fact that he recommends early aspiration in the treatment of the disease.

The book is to be cordially recommended. It is, undoubtedly, one of the best on the subject at our command—well thought out, excellently arranged, written in a fluent and limpid style that renders reading easy and pleasant, and replete with practical suggestions relating to diagnosis and treatment that must appeal to the general practitioner. A. K.

FOODS AND THEIR ADULTERATION. By HARVEY W. WYLIE, M.D., Ph.D. Philadelphia: P. Blakiston's Son & Co., 1907.

PUBLICATIONS that tend to lead to greater familiarity with dietetics and a more proper use of dietetics in the treatment of the sick are exceedingly valuable and desirable. Among medical men, dietetics is used with much less regularity and much less skill than are most of the other important measures that are employed in the treatment of the sick, and yet no one questions the fact that skilfully used diet has, in many conditions, an effect equal to or, at times, greater than other measures. One thing that is largely influential in preventing the skilful and regular use of proper diet is a lack of knowledge of food values and the composition of foods; so that a large proportion of persons, in regulating the diet, do so chiefly upon the basis of merely recommending certain food-preparations that they have been taught to believe are suitable in the condition at hand; while the rational manner of carrying out this matter is, of course, to have a comprehension of foods and their character and composition, just as one has a comprehension of the character, composition, and physiological action of drugs. The only way to do this is to acquire a knowledge of the chemistry of foods and of their value when taken into the organism.

Dr. Wylie's book will be a valuable source of reference to persons who desire to acquire this exceedingly important knowledge of foods and their composition, and likewise is an authoritative discussion of the origin and manufacture of foods and food-products, and an important description of adulterations, together with a discussion of the national food-laws and regulations. He takes up a consideration of the proper food-ration, the functions served by foods, and their classification; and then explains the chemical terms used in describing foods. He goes into a complete discussion of the various kinds of foods, such as meat, poultry, eggs, fish, milk, and milk-products, cereals, vegetables, etc. He then considers the manner in which these foods are prepared for use; the names of parts that are used, as in meats, the manner in which the foods should be cared for, stored, and delivered; the way in which they may be preserved; the general processes by which some of them may be most properly prepared for the table; and various similar points. As a work of reference, to physicians in particular, in connection with their use of diet, the book is one that is very opportune and valuable.

D. L. E.

THE COMMONER DISEASES OF THE EYE: HOW TO DETECT AND HOW TO TREAT THEM. By CASEY A. WOOD, M.D., C.M., D.C.L., Professor of Ophthalmology, Northwestern University Medical School, and THOMAS A. WOODRUFF, M.D., C.M., L.R.C.P. (Lond.), Ophthalmic Surgeon to St. Luke's Hospital, Chicago. Third edition; pp. 598; 280 text illustrations, and 8 colored plates. Chicago: W. T. Keener & Co., 1907.

THIS is a well written type of the shorter treatises upon the eye, and may be unhesitatingly recommended to those who require such a book. While it has many hints, such as the methods of recognizing the commoner forms of ophthalmia, intended more especially for the general practitioner, it will not, of course, by itself make an oculist out of that much-talked-of and bewritten individual. The accounts of the method of performing the various operations in the surgical maladies of the eye are clear enough for the reader who is prepared by previous information to comprehend the subject, and many general practitioners may gain enough from the descriptions to acquire an intelligent idea of the methods of ophthalmic surgery. The illustrations, many of which are original, are a valuable part of the work. Three editions in as many years is good evidence that the book has made its way.

T. B. S.

Manual of the Diseases of the Eye. For Students and General Practitioners. By Charles H. May, M.D., Ophthalmic Surgeon to the City Hospitals, Randall's Island, New York. Fifth edition; pp. 391; 362 illustrations, including 22 plates, and with 62 colored figures. New York: William Wood & Co., 1907.

When we read that the first edition of this work appeared in the fall of 1900, that a fifth edition is now required, and that translations and editions have been prepared for the six leading nations of Europe, we have a concert of testimony as to its merits more convincing than the opinion of any single reviewer. So far as the subject can be presented in a manual of its size, the work contains in a lucid and easy style about all that is to be said upon the subject. Individual opinions, of course, will vary upon particular points, and no writer can be expected to be in complete agreement with every other worker in the same field; but, all things considered, the work is worthy of the exceptional success it has attained.

T. B. S.

Atlas and Text-book of Human Anatomy. By Dr. Johannes Sobotta, Professor of Anatomy in the University of Würzburg. Edited, with additions, by J. Playfair McMurrich, A.M., Ph.D., Professor of Anatomy in the University of Michigan. Vol. II; pp. 194; 214 illustrations, mostly in colors. Philadelphia and London: W. B. Saunders Co., 1907.

We have already drawn attention to the excellence of Sobotta and McMurrich's *Atlas and Text-book of Human Anatomy* when noting the publication of Volume I. Volume II treats of the viscera and the heart, and in every way is quite as excellent as Volume I. The illustrations are examples of what may be accomplished by multicolored lithography, the three-colored process, colored half-tones, etc.; they are really unsurpassed, not only from an artistic point of view, but also from that of anatomical fidelity. As is quite appropriate in an atlas, the text is somewhat subordinate to the illustrations, but it is eminently satisfactory. The unusual value of the book, suggested by Volume I, is fully sustained by Volume II; the atlas is undoubtedly one of the very best.

A. K.

PROGRESS

OF

MEDICAL SCIENCE.

MEDICINE.

UNDER THE CHARGE OF
WILLIAM OSLER, M.D.,
REGIUS PROFESSOR OF MEDICINE, OXFORD UNIVERSITY, ENGLAND,
AND
W. S. THAYER, M.D.,
PROFESSOR OF CLINICAL MEDICINE, JOHNS HOPKINS UNIVERSITY, BALTIMORE, MARYLAND.

Percussion in the Diagnosis of Respiratory Disease.—R. W. PHILLIP (*Edin. Med. Jour.*, 1907, xxii, 473) says that percussion serves not merely as a determinant of the size of the lung, and of its consistence at a given area—normal, infiltrated, excavated, or otherwise—but it affords a most valuable physiological test of the functional activity of the organ. For this latter determination Phillip uses a method which he calls "tidal percussion." This consists of the practice of percussion alternately during expiration and full inspiration. For early diagnosis this is especially valuable at the apices; but it is also helpful at the bases and anterior edges. In health the rise in the upper limit of resonance above the clavicles is quite marked during deep inspiration, and all degrees of variation may be found in this rise, depending upon how much the lung is affected; it may be of special value when only one apex is involved, as one then has the normal increase in resonance on the opposite side to compare with. Phillip asserts that by this method differences in the resonance of the extreme apices and bases can be easily determined, and that, especially at the apices, this change in pulmonary resonance should be carefully estimated by carrying our percussion higher above the clavicle than is done with the usual perfunctory percussion, either directly over the clavicle or only one finger's breadth above it. His method is to place the finger horizontally across the apex of the lung from back to front in a plane at right angles to the vertical diameter of the lung. (This is illustrated in the article, as is also the change noted in the size of the apex in different conditions.) During the progress of the disease much information may be obtained in respect to prognosis. Phillip says: "As the disease becomes arrested a considerable increase in degree and extent of resonance during full inspiration is frequently observed. Such a return of the ampler tidal resonance affords one of the most satisfactory indications of improvement. On the other hand, as the disease advances, the amount of tidal percussion then is reduced still further."

Epidemic Pneumonia.—MARSHAL FABYAN (*Johns Hopkins Hospital Bulletin*, 1907, xviii, 439). The fact that pneumonia may occur at times in peculiar groupings and spread as if by direct contagion is of considerable interest; such epidemics have been reported often. Fabyan reports the cases of a family of ten people, six of whom developed acute lobar pneumonia within a period of ten days. Only two of the family escaped being sick at all, one of whom lived away from home and only returned for a while to nurse the others. The father of the family had been ill with a "cold," hoarseness, and abdominal pain three days before the onset of the first case of pneumonia; and although pneumonia was not definitely recognized, he may have been the source of the infection for the family. The conditions under which the patients lived were bad. It is interesting that when two of the patients slept together the second infection followed the first in every case in from six to nine days. One case, that of a girl aged fourteen years, was fatal. Fabyan reviews the literature bearing on this subject, which reveals wide differences of opinion as regards the contagiousness of pneumonia. No special etiological factors accounting for this apparent contagiousness could be found in the above group.

The Ophthalmo-Tuberculin Diagnostic Test.—EDWIN R BALDWIN (*Jour. Amer. Med. Assoc.*, 1907, xlix, 1669). The early diagnosis of tuberculosis is so important that every apparent improvement in methods is worthy of a careful trial. The use of tuberculin, both hypodermically and as a skin vaccine has been widely practised. Professor Calmette has recently advised the introduction of weak tuberculin solutions (1 per cent.) into the eye; a marked conjunctival hyperemia results in infected individuals. Baldwin has used this method, slightly modified, and reports on the reaction in 137 cases. His conclusions are that it is a little premature to express an opinion as to the value of this test in diagnosis when compared to the subcutaneous one However, one can see a close similarity in the results with those obtained in the fever test, which, also, when given to healthy and suspected individuals, has shown a high percentage of positive reactions. The prompt positive reaction in the eye adds to the suspicion when symptoms of tuberculosis are present. No value is to be placed on a positive reaction in the absence of symptoms of tuberculosis. Baldwin hopes that, ultimately, carefully controlled results at the postmortem table will give us the real limitations of these methods of diagnosis. Certainly, the simplicity of the method (as the dose can now be obtained in little capillary tubes such as are used for glycerinized vaccine) should recommend its use and the careful determination of its value.

A later report along this same line, with the results of the ophthalmic reaction in 242 cases, is given by Smithies and Walker (*Jour. Amer. Med. Assoc.*, 1908, l, 259), who conclude that this test is of undoubted service in the diagnosis of tuberculosis. In no cases in which its worth could be tested clinically by the finding of tubercle bacilli did they fail to obtain decided ocular manifestations following the instillation of tuberculin. This reaction did not follow when instillations were made in 126 individuals affected with diseases other than tuberculosis. It was not obtained in 74 apparently healthy adults. Care in the technique of its administration is very necessary for the success of the reaction. When the ophthalmic reaction is positive a careful complete examination of the suspected focus must be made before passing final judgment. All suspicious cases which fail to respond to one instillation should be reinstilled from two to five times and careful examinations made. None of the reactions (skin, subcutaneous, or ophthalmological) take the place of a thorough examination of the patient. They are, however, all confirmatory. Properly administered, the ophthalmic reaction is quite as valuable to the general practitioner as any of the others, and its convenience and rapidity of action certainly commend it.

Compensatory Venous Congestion.—W. J. Calvert (*Johns Hopkins Hospital Bulletin*, 1907, xviii, 447). In comparing the compensation of mitral and tricuspid insufficiency it has been noted that the liver and the peripheral vessels play the same role in compensation of the tricuspid valve as the right ventricle in compensating mitral insufficiency. Solomon found that the normal liver under high pressure holds its volume of water, most of which is expelled when the pressure is removed. This sponge-like activity of the liver may, with continued pressure, be destroyed, and so the degree of activity of the liver in compensating the heart lesions may be interfered with in the different forms of cirrhosis, etc. In order to bring out more clearly this role of venous congestion, Calvert studied more especially cases of pericarditis with effusion which, by pressure on the vena cava in the pericardium, produced most striking effects on the venous circulation. When high, this pericardial pressure causes the veins to collapse. When low, they are open. The only pressure that could keep them open is the venous pressure due to congestion. This must then compensate the pressure of the pericardial fluid on the vena cava, and this compensation must continue or the veins will be collapsed and prevent the blood from entering the heart. As the maximum venous pressure can be produced in pericarditis with effusion, and is no greater in tricuspid lesions, it must follow that this can be compensated for in the same degree as in pericarditis with effusion. The activity of the auricle must be taken into account, but if inactive and dilated, as suggested by Franke, it simply adds that much blood to the venous congestion. The congestion including the liver and right auricle in tricuspid insufficiency must be likened to the left auricle, pulmonary congestion, and right ventricle in mitral insufficiency. The right ventricle in tricuspid lesions plays the same role as the left ventricle in mitral lesions. Calvert concludes that on account of the importance of venous congestion in compensating pericardial and pleural effusions, pneumothorax, and tricuspid lesions, the name "compensatory venous congestion" should be used as a term which more accurately describes the function of congestion than the term chronic passive congestion, which was adopted at a time when the role of congestion had probably not been fully considered.

Additional Observations on Microbic Cyanosis—G. A. Gibson (*Quar. Med. Jour.*, 1907, i, 29). A few years ago Stokvis described for the first time the occurrence of cyanosis as the result of intestinal troubles. He believed the cyanotic appearance was produced by methemoglobin, but did not discover the manner in which the blood changes were produced. In his case there was clubbing of the fingers, deep cyanosis, and considerable albuminuria. At autopsy the lesions were those of ulcerative enteritis and parenchymatous nephritis. Since then there have been a few reports of such cases by different authors, in all of which the connecting link between the intestinal troubles and the cyanosis was established; yet the views as to the exact relation between the two conditions have varied. Gibson's case was that of a lady, aged thirty-six years, who had suffered for some years with weakness, headache, giddiness, and fainting. The skin and mucous membrane during these years had gradually become very cyanotic. The blood was as follows: Red blood cells, 3,200,000; hemoglobin, 48 per cent.; color index, 0.75; leukocytes, 7400. There was some poikilocytosis, but no nucleated reds or chromatophilia. Differential count showed 65 per cent. polymorphonuclears, 28 per cent. small mononuclears, 5 per cent. large mononuclears, and 2 per cent. eosinophiles. There was much intestinal irritation and gastric disturbance. The urine contained no albumin. Examination of the blood showed the presence of methemoglobin and a considerable amount of nitrites. The saliva also showed more nitrites than normal. The feces did not contain methemoglobin, and possessed no power of converting normal ox blood into methemoglobin. There were present, however, some nitrites. On the supposition that the formation of these nitrites might be hematogenous and due to bacterial agency, careful bacteriological examination of the blood was made with the isolation of an organism resembling the colon bacillus. The original source of this condition was traced to the bowels and the patient treated accordingly by means of intestinal antisepsis, with marked alleviation of her symptoms; when seen some time later the cyanosis had entirely cleared and the blood changes approached normal. There was no methemoglobin in the spectroscopic examination of the blood, and no organisms were cultivated from it. Toxic processes having their origin in some local infection with the colon bacillus are, of course, widely known, yet the idea that changes such as these might be brought about by their final entrance into the blood is entirely new. Gibson feels convinced that in the above-described condition we are dealing with a hitherto undescribed but perfectly definite form of disease. The colon bacillus may give rise to three stages of infection, in the first of which the intestinal symptoms are prominent as enteritis, diarrhœa, headache, and depression; in the second, the changes are referable to the formation of the nitrites which, by their absorption into the blood, give rise to methemoglobin and resulting cyanosis; in the third, the entrance of the bacilli into the blood and their multiplication there results in the development of the condition described above. As regards treatment, this should, of course, be intestinal antisepsis, either medically by drugs or, if justified, surgically by means of a colostomy and irrigation.

Multiple Telangiectases.—This condition is the subject of two very interesting papers by OSLER, the first of which is on "Multiple Hereditary Telangiectases with Recurring Hemorrhages" (*Quarterly Medical Journal*, 1907, i, 53). The author observers that telangiectases may be seen under the following conditions: (1) On the cheeks, nose, and ears in persons who are exposed to the weather and in heavy drinkers. They may appear in very young persons. They are commonly seen on the skin of the thorax along the line of attachment of the diaphragm. (2) Small pink spots often pin point in size. (3) Small nodular forms which may be congenital. (4) The spider form with its interesting association with cirrhosis of the liver. (5) The mat form. (6) The generalized acquired telangiectases (reported below); and lastly, (7) the multiple hereditary form with recurring hemorrhages. Illustrative of this latter group, Osler refers to the history of two brothers who had numerous telangiectases of the skin and mucous membranes (*Johns Hopkins Hosp. Bull.*, xii, 333), and who from childhood had bleeding from the nose and some of the spots. Seven members of their family had been subject to them. In one case at autopsy telangiectases were found in the mucous membranes of the stomach. Another case, reported in detail and illustrated, is that of a doctor, aged fifty-three, who was extremely anemic when first seen and had numerous telangiectases over the face, ears, and lips. He had been a bleeder since his tenth year. There was a family history of bleeding and of the presence in some members of the telangiectases. This patient improved greatly under the use of calcium lactate, 60 grains daily. His coagulation time had been reduced from six to seven minutes to one and a half minutes. In this condition the telangiectases are of three kinds—the pin point, the spider form, which is the commonest, and the nodular variety. These are well seen in the accompanying illustrations. Osler has brought together the history of eight families affected in this same manner, in many of which the disease was serious on account of the severe and frequent bleedings. Marked anemia and even death have been the outcome.

As regards treatment, the careful application of the cautery at the outset of the disease, especially to the stellate veins of the nostrils, may prevent hemorrhages. This, while producing severe hemorrhage in one case, had a beneficial result ultimately, as no severe epistaxis occurred for many months. Calcium lactate seems to help some cases very markedly.

The second article by Osler is the report of a case which falls unde- group 6 as reported above, that is, "Telangiectasis Circumscripta Unir versalis" (*Johns Hopkins Hosp. Bull.*, 1907, xviii, 401). This excessively rare form of the disease, of which only some 15 to 20 cases are on record, occurred in a man, aged thirty-nine years, of a markedly neurotic temperament. The family history was negative. His general health had been only fair, and the purplish mottling of the skin had been noted during the past ten years. There was no definite history of continued bleeding. The present attacks of severe pain and associated prostration led to his admission to the hospital for treatment. During his first attack of pain a large amount of bloody urine was passed. Physical examination was practically negative excepting for the appearance of the skin. The face showed a few spots like acne rosacea, but over the trunks and extremities were numerous dark red spots looking like a fresh purpura. They were thickly set over the chest and back, on the flexor surfaces of the forearm and inner aspects of the arm. The spots varied in size from 2 to 6 mm. in diameter and often coalesced. They were altered in color to a vivid red by friction. The hands and feet were of a deep purple color, the fingers cyanotic, and looked like the picture of Raynaud's disease. Factitious urticaria could be readily produced. (This and the skin conditions as described above are well shown in plates.) Osler notes that this is an acquired and not a congenital form. The capillaries and not the small venules are involved, that is, there is a prominent dilatation of the capillaries in localized areas. The condition of the hands and feet suggests the local asphyxia of Raynaud's disease. There was little or no change in the patient's condition a year after first seeing him. The dermatographia was always most marked and very striking. The recurring attacks of colic, for which no cause could be found, may have been associated with a gastro-intestinal urticaria, such as is responsible for the colic in Henoch's purpura. The hematuria may be a form of so-called renal epistaxis, such as is met with sometimes in Raynaud's disease. As regards treatment, modified Weir Mitchell rest cure, with symptomatic measures were of some benefit in this case.

SURGERY.

UNDER THE CHARGE OF

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Mechanical Obstruction by Torsion of the Whole of the Small Intestine and its Mesentery.—Delbet (*Arch. gén. de Chir.*, 1907, i, 343) reports a case in which, seven months before, the patient had had the appendix removed. The present attack began suddenly with severe pain throughout the whole abdomen and bilious vomiting, and these symptoms were present on his admission to the hospital. The abdomen was moderately distended. The diagnosis was made of occlusion by an adhesion or a band high in the small intestine. A median laparotomy below the umbilicus was performed forty-four hours after the beginning of the attack. Some brownish fluid escaped, and there was discovered, to the inner side of the cecum, a tense band, under which two loops of intestine escaped. Total volvulus of the small intestine was diagnosticated. This was uniformly distended and bluish in color and its mesentery brownish and thickened. The large intestine was contracted and normal in color. Evisceration and detorsion of the intestinal mass was performed and two intestinal loops released from under some old adhesions. Drainage was employed. Recovery ensued. Early operation probably saved the patient. In torsion of the whole of the intestine the two points compressed are at the extremities of the small intestine. There is considerable distention, but it varies with the resistance of the wall. The abdominal wall is always very tense and markedly tympanitic, to the extent of masking the liver dulness. There is fluid in the peritoneal cavity resembling that of a strangulation. Bilious vomiting is rarely absent and is usually abundant. While the diagnosis is usually easy at operation in a partial volvulus, it is not so in a total volvulus. Only exceptionally can one see the mesentery twisted into a cord. Delbet insists on the following signs of recognition: The small intestine is distended and congested in its whole extent; the cecum is empty; the last part of the small intestine is engaged behind a prominent band, under which issues another distended loop; this loop is not fixed against the cecum, as it would be if it were part of a retroperitoneal hernia; finally, there exist two bands formed by dragging of the parietal peritoneum. One is directed upward toward the left kidney, the other descends toward the iliac vessels.

A Case of Radical Mastoid Operation, with Subsequent Septic Infection and Rupture of the Lateral Sinus.—Renshaw (*Brit. Med. Jour.*, 1907, ii, 1208) operated on a young man who had had purulent otorrhœa of the left side for five years. On commencing to remove the bone the sinus was almost immediately exposed, lying only a little over one-eighth of an inch behind the posterior wall of the meatus. The sinus wall was apparently uninjured. The antrum and attic being freely exposed, the bone was everywhere found extremely sclerosed, with patches of caries After removal of all diseased tissue and arrest of hemorrhage, and treating the cartilaginous meatus by the Panse method, the cavity was packed and the superficial wound sutured. The packing was removed on the third day and daily after that. On the morning of the seventh day the temperature rose to 103.2°, but at 6 p.m. it was normal. On the following day there was a similar rise, which was repeated on the next day. The wound was then reopened to ascertain if a septic thrombus had formed in the lateral sinus. Before this could be done there was a sharp hemorrhage from the ear. On opening the original incision, the cavity was found full of clot. On carefully removing it there was a sudden gush of blood, evidently from the spot in the sinus exposed at the first operation. This opening was plugged with iodoform gauze and a rubber tube was passed from the meatus into the deeper part of the antrotympanic cavity, and the wound dressed. On removal of the packing two days later a severe hemorrhage followed. Fresh packing was inserted. The temperature continued to rise and 10 c.c. of antistreptococcic serum was injected. The temperature immediately improved, but remained irregular. Five days after the second operation the dressing was removed, but the gauze in the sinus aperture was undisturbed. This was removed piecemeal at the subsequent dressings. A cure gradually followed.

The Treatment of Fractures of the Fingers.—Jottowitz (*Zentrlbl. für Chir.*, 1907, xxxiv, 1313) says that in his experience the deformity in these fractures was almost always of such a character that the fragments made an angle opening on the extensor side of the fingers. He has repeatedly seen old healed fractures which retained this deformity, and in these the closure of the fist is much disturbed. A more or less sharp bony projection is found at the seat of fracture, which is prominent on the flexor side of the finger. The flexor tendons thus become stretched over this prominence, producing flexion of the middle joint and to a less extent of the terminal joint of the finger. The result of the faulty position of the distal fragment is to produce extension at the metacarpophalangeal joint so that when a fist is made the fractured finger remains in a posterior position. Good results depend first upon complete reduction of the deformity. The finger should not be splinted in complete extension, especially if the fracture is located near the base of the finger. A flexed position of the whole finger is much better, since it best corrects or overcorrects the usual deformity. This was accomplished by placing an ordinary roller bandage in the palm of the hand and flexing the fingers over it, only the terminal phalanx remaining extended. One or the other neighboring finger may be included in the dressing to prevent lateral displacement of the fragments.

The Preliminary and After-treatment for Laparotomies.—HIPPEL (*Zntrbl. für Chir.*, 1907, xxxiv, 1345) says that Vogel recently reported on the excellent results which he obtained from the subcutaneous use of physostigmine for the stimulation of peristalsis in the after treatment of laparotomies. By the early accomplishment of this object he considered that we had the surest means of avoiding adhesions. Purgatives cannot be employed for obvious reasons. He has not seen postoperative ileus since he has been employing physostigmine in this way. With a similar experience in 60 cases, Hippel is convinced of the value of this treatment. He departs somewhat from Vogel's method. Immediately after the operation he injects 1 mg. of physostigmine, and repeats it every three hours until the bowel action sets in, which is shown by a feeling of compression in the abdomen. Then a rectal tube is introduced and left in for about an hour, and from this the gas escapes. Generally from two to four doses are required, and these cause no evil effect. On the day after operation a glycerin enema will produce a movement of the bowels, usually without pain. Besides tending to prevent adhesions by preventing distention, it decreases the number of ventral hernias, and there is less danger due to elevation of the diaphragm from gaseous formation with its injurious effects upon the heart and lungs. In addition, from the earlier intestinal action, nourishment is given earlier and in larger quantities and the patient gets out of bed earlier.

The Transverse Incision for Nephrotomy.—ZONDEK (*Zntrbl. für Chir.*, 1907, xxxiv, 1369) says that the neighboring branches of the renal artery run in a radiating direction from the hilum to the lateral convex surface of the kidney. An incision in the same direction can fall between two neighboring branches and the damage to the tissue be very slight. This will be particularly limited to the unavoidable division of the peripheral branches. With the kidney freely exposed the incision can certainly not avoid all the large branches, and the danger will increase as the incision approaches the hilum, from which the branches spread out. Even if, unfortunately, two neighboring branches should be divided, the damage to the parenchyma would then not be very marked and the disturbance of the blood supply would be slight. The incision must be a radiating one for all parts of the dorsal surface of the kidney, whether in the middle of the kidney or near the poles. The depth of the incision into the parenchyma, however, determines the damage done either by the transverse or the longitudinal incision. In the region of the cortex little damage is done whether the transverse or the longitudinal incision is employed. The large calibered vessels are located in the depth of the kidney.

The Treatment of Acute Suppurative Inflammation by Passive Congestion.—Wrede (*Archiv f. klin. Chir.*, 1907, lxxxiv, 733) says that the same material may yield different results under different conditions, and that these results may be viewed from different standpoints. He says that, theoretically and practically, the effects of suction, as by cupping, and those of passive congestion by the use of the bandage around the limb are not the same. Cupping in some inflammatory conditions works better than the bandage. The question of incision in the inflamed area has often been ignored. Croce incised even when pus was not present. Many others have used incision in connection with the Bier method. Wrede considers that the good results, when both were employed, were due to the incision and not to the passive congestion. The secondary lymphangitis, severe inflammation, and suppuration, which cannot be avoided by the passive congestion, have been looked upon as beneficial. Wrede cannot see its advantage, and is strongly in favor of the older method of treatment. He does not dispute the good effect of passive congestion for many cases, but he differs from Bier in estimating the value of this method as contrasted with incision. There are conditions, at times, in severe cases, when the increased congestion and increased inflammation produce evil results.

Experimental Studies on the Pathology and Surgery of the Heart.—Haecker (*Archiv f. klin. Chir.*, 1907, lxxxiv, 1035) lays special stress on the value of Sauerbruch's apparatus for the performance of intrathoracic operations, particularly for those on the heart. The tranquility from absence of pneumothorax, and impaired breathing, facilitates an operation upon such a restless organ as the heart. The anxiety of avoiding a pleural opening, and, therefore, pneumothorax, is overcome, as it matters little whether such an opening is present or not. Generally, the intercostal incision is to be recommended because it can be made quickly without loss of blood, and offers a free opening and good view. A developing pneumothorax, by collapse of the lung, lessens the hemorrhage from a heart wound, and at the same time the heart wall is relaxed. If it continues long it impairs the heart's strength. Great advantage of these facts can be taken in the Sauerbruch apparatus for lessening hemorrhage and introducing sutures through the relaxed heart wall. By avoiding pneumothorax the danger of infecting the pleural cavity is considerably reduced. Bleeding occurs during systole. In introducing the sutures the heart can be grasped in such a way that the veins leading into it can be compressed. The heart being turned forward the hemorrhage is also considerably diminished by the resulting kinking of the vessels. A continuous suture of median-sized catgut or of silk is recommended, and it should include the epicardium and myocardium. The first end should be left long as a retractor. After ligature of the superior cava, dogs died in from twelve to fourteen hours with gradual diminution of the blood pressure. They withstood well, for ten minutes, simultaneous clamping of the two body veins. Thrombosis of the veins during this period was not observed. It is possible, by clamping the superior and inferior cavæ and the great vein of the heart, to perform short, bloodless operations on the heart. In this manner, one of the cavities of the heart was successfully opened extensively, a good view of the inside obtained, and palpation carried out. Penetration of air into the opened heart cavity, air emboli in the lung or brain vessels, were not observed. Small, foreign bodies, finding their way into the heart, were immediately carried by the blood current, with the exception of needles, which remained in the heart. Healing of a foreign body in the heart is possible. If it produces disturbances the heart cavity should be opened, bloodlessly, and the body removed. Generally, the effect of its presence was to produce an irregularity of the pulse, which quickly disappeared. By the employment of the bloodless method, pieces of the heart wall were successfully removed. It was observed several times that, apparently, a wound in one part of the heart wall (left auriculoventricular septum?) caused the heart to stop immediately. After exposing the heart freely enough, deficiencies in the valves and other anatomical changes could easily be produced in animals. Haecker would go further than to operate on the heart merely for wounds in its walls. He considers it possible to remove foreign bodies when they give trouble, even to the extent of opening the heart cavity. He believes it will be possible, in aneurysms of the heart as of the aorta, rebellious to every other treatment, to expose the aneurysm for surgical treatment.

A Contribution to our Knowledge of Typical Dislocation; Fracture of the Intercarpal Joints.—SCHOCH (*Deut. Ztschr. f. Chir.*, 1907, cxi, 53) says that the combination of anterior dislocation of the semilunar bone with fracture of the scaphoid and anterior displacement of its proximal fragment, first described by de Quervain, has been demonstrated by later experience to be a typical injury. Next to the isolated dislocation of the semilunar and fracture of the scaphoid it is the most frequent carpal injury. Schoch considers that the most simple name for it is "typical intercarpal dislocation fracture." It is caused by severe violence, in the majority of cases by a fall from a height on the outstretched arm, in which the hand is either in moderate dorsal flexion and strikes first on the small heads of the metacarpal bones, or it is in hyperflexion with the ball of the hand receiving the force of the fall, or, finally, it is in volar flexion, and the force is received by the dorsum of the hand. In explaining the mechanism one must take into consideration the fact that the distal portion of the scaphoid and to a certain extent the cuneiform with the pisiform are in relation with the distal portion of the carpus, while the semilunar and proximal portion of the scaphoid, alone, bring the radius in relation with the rest of the carpus. The chief symptoms of this injury are: swelling of the wrist joint, failure of active movements of the hand, and great pain upon passive movements. The carpus is also thickened, broadened, and shortened.

Beyond the radial border, anteriorly, is found bony resistance; the finger movements are disturbed, and, finally, we have symptoms of pressure on the median nerve. These symptoms and the skiagraph make the diagnosis. The prognosis is always to be regarded as serious. Only when the reduction is successful can an approximately complete return of function be hoped for. If operative treatment is required, movements of the hand will be disturbed while the finger movements and the strength almost never return to the normal, so that at least from one to three years will be necessary before the patient will be able to use the hand in heavy work. Without operation the hand will be in a much worse condition, and in unfavorable cases or from inadequate retention the wrist may become almost completely ankylosed. The treatment for the great majority of cases is as follows: First non-operative, then operative reduction. When these are not successful, according to circumstances, the proximal fragment should be extracted and the semilunar replaced, or the latter with the scaphoid should be extirpated, or, finally, the distal fragment of the scaphoid fragment should be extirpated. The after-treatment consists chiefly in vigorous and long-continued systematic movements, and after about one to three months the patient should resume work, at least in part.

Treatment of Facial Neuralgia.—Depage (*Jour. de chir. et ann. de la soc. Belge de. chir.*, 1907, vii, 470), in discussing this subject before the society, says that when the neuralgia cannot be cured by medical treatment sufficiently prolonged, it is proper to operate. Partial excisions of the peripheral branches of the trigeminal nerve are generally followed by recurrence, sooner or later. Excision of the Gasserian ganglion is an operation, of which, under proper technique, the results are very encouraging. The cures which it produces are absolutely permanent. Experimental researches have established that sudden and violent tearing away of the large divisions of the nerve at the base of the skull, permanently interrupts the sensory paths of the trigeminal nerve. The favorable results obtained in man make this operation more desirable than excision of the Gasserian ganglion, the execution of which is more difficult. The future will decide whether the newer operation will give as certain results.

Primitive Renal Lithiasis.—Sourdille (*Archiv. gén. de Chir.*, 1907, 1, 418) says that in renal lithiasis the diseased kidney is generally polyuric as compared with its fellow. When this relation is reversed the diseased kidney is totally insufficient and functionally incapacitated. On the other hand, if the total quantity of urine for twenty-four hours is distinctly above the normal, while the diseased kidney is hardly functionating, it is better to be suspicious. The sound kidney will be likely to give way because a polyuric kidney is a diseased kidney—a forced kidney. The quantity of urea secreted by the calculous kidney is generally very appreciable, and the average relation between sound and diseased kidney is as 1 to 2. It is the same with the chlorides. The difference in the secretion of the two kidneys is often insignificant. When the two secrete the same quantity of urine there is less urea and phosphates from the diseased kidney, and the freezing point of the urine is lowered. When the kidney which secretes the more urine presents at the same time a higher freezing point and more urea and phosphates per liter, this kidney should be considered the better of the two, not only from the functional point of view but from the anatomical also (Albarran). The elimination of methylene blue is often much retarded and less intense in renal lithiasis, and it is absolutely insufficient as a means of judging the condition of the kidneys in this affection. Albarran showed, experimentally, that the function of the diseased kidney is much more constant than that of the healthy one. The difference between the two kidneys is exaggerated by the variations in function of the healthy kidney. From what precedes it it is evident that renal lithiasis has a double localization. If there is not double lithiasis there is at least double nephritis, and beyond the local lesions due to the stone the one kidney is as badly off as the other. Nephrectomy should be done only in case of absolute necessity.

The skiagraph is to renal calculus what the cystoscope is to tumors of the bladder. The chemical composition of the stone is of great importance. Oxalic calculi are always visible by the skiagraph. Then come the phosphatic and those of alkaline carbonates. Uric acid calculi do not give a shadow. Those cases of uric acid calculi, published as giving skiagraphic shadows, had an appreciable quantity of phosphates or oxalates. The size of the stone and of the patient also affect the distinctness of the skiagraph: positive results affirm the diagnosis. As for the negative results, if the lithiasis is aseptic, they do not exclude the diagnosis of uric acid calculi; but if the urine is septic they eliminate the diagnosis of large renal calculi.

Chronic Adhesive Appendicitis.—HABERER (*Mitt. a. d. Grenzgeb. d. Med. u. Chir.*, 1907, xviii, 169) says that primary chronic appendicitis does not give a well-defined clinical picture. The patients complain of long-continued disturbances in some region of the abdomen, frequently with a changing location. Observation for some time is always necessary in order, finally, to make the diagnosis with any certainty. The objective symptoms are also very vague. A changing seat of tenderness is observed, and fever is sometimes mentioned. Generally, according to other writers, there is chronic constipation which is not rarely associated with the signs of membraneous colitis. Cecal distention is said to be present in almost all the cases, and often by repeated examination the appendix can be palpated. From a study of 7 cases, Haberer says that the vague findings were in marked contrast to the complaints of the patients. In no case was there anything pathological in the region of the cecum, and in none was tenderness at McBurney's point made out. Symptoms permitting the diagnosis of a nervous affection in the region of the appendix were found in no case. Tuberculosis could not be established in any case, and in not one was there fever during the stay in the hospital. In the two women, among his cases, disease of the genital organs could be excluded with certainty. The diagnosis, supported chiefly on the statements of the patients, could only be made by exclusion. Haberer considers that it is not sufficiently emphasized that an appendicitis which runs a course not merely free of attacks, but is entirely symptomless, can lead to changes in the appendix and extensively in the peritoneum. This can develop the picture of an intestinal stenosis with severe constitutional disturbance and advanced emaciation.

THERAPEUTICS.

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Colloidal Metals in Infections and Especially in Pneumonia.—Robin (*Gaz. méd. de Paris*, xiii, 7, 3) reports 53 instances of pneumonia treated by these substances with a mortality of 6 patients; in 63 per cent. of the patients defervescence took place on the eighth day. The results in bronchopneumonia were less favorable, 6 deaths in 13 patients having been reported. The metallic ferments were administered deeply under the skin in doses of 2½ drams or intravenously in half this amount. The metal employed seemed to make no difference in the result. The treatment should be begun on the fourth day and should be repeated every two days. Other infections have been treated by the same means, the injections consisting of 75 minims of colloidal silver, palladium, or platinum, and good results have followed the treatment in instances of enteric fever, epidemic influenza, severe jaundice, acute articular rheumatism, scarlatina, and pulmonary tuberculosis.

Bacterial Vaccines in Therapeutics.—Ross (*Jour. Amer. Med. Assoc.*, 1907, xlix, 1245) states that he is firm in the belief that proper inoculation with appropriate bacterial vaccines is a powerful expedient for the cure or control of many diseases due to microörganisms. He is of the opinion that, though estimation of the opsonic index is often unnecessary, still such investigation has been and still is of great service in the determination of proper dosage and appropriate time for inoculation and reinoculation; that the estimation of the opsonic index, according to our present methods, is mathematically accurate few would claim, but that it is sufficiently so to serve as a useful guide in vaccine therapy can hardly be denied.

The Absorption of Digitalis and Glyceryl Nitrate.—Zemp (*Jour. Amer. Med. Assoc.*, 1907, xlix, 16, 1349) gives the following practical deductions from a study of the absorption of these important and much-used drugs: Digitalis cannot be relied upon in emergency when quick heart stimulation is necessary. Here we should employ it in connection with alcohol and ammonia, for when the action of the diffusible stimulants is beginning to wane the digitalis will be taking up the work and will continue it for some time. Dropsical patients who have taken large doses of digitalis for some time should be tapped with care, for the sudden withdrawal of the fluid may cause absorption of enough of the drug to poison the patient. Digitalis should not be given in instances of acute gastric disturbance, since the drug is irritant to mucous membranes. Here the therapeutic effect of the drug may be obtained by applying a poultice made from the leaves to the loins. Most digitalis preparations are precipitated into the tissues when given hypodermatically, which accounts to some extent for the slowness of the drug's action when given in this way. Glyceryl nitrate may be used when a quick effect is desired to relieve pain due to muscular spasm, as in angina pectoris. When given for its effect in relaxing arterial tension it should be administered at short intervals. It is useless to give this drug three times daily; nor should it be combined with digitalis with the idea of overcoming the contraction of the arterioles caused by the latter, for the effect of the one is brief while that of the other is prolonged. The counteraction may, however, be obtained by giving the glyceryl nitrate separately and at proper intervals.

Tuberculin Injections in Chronic Joint Disease.—Ridlon (*Amer. Jour. Orthop. Surg.*, 1907, v, 14) concludes a paper on this subject as follows: A low tuberculo-opsonic index with local joint symptoms may be accepted as evidence of joint tuberculosis, but a practically normal tuberculo-opsonic index, together with local joint symptoms, neither proves nor disproves the existence of articular tuberculosis. When the diagnosis of joint tuberculosis has been made, a high tuberculo-opsonic index should be maintained, if possible. With a high tuberculo-opsonic index an operation for the removal of all or part of the local disease may be undertaken; not so with a low index. If the use of the diseased joint lowers the index the joint must be protected; if not, the joint may be used; if use raises the index it should be insisted upon. General elevation of temperature after a tuberculin injection indicates too large a dose. A persistent lowering of the index during injection treatment indicates that the injection has been given at the wrong time, during the so-called negative phase. While realizing that this form of treatment has been employed too short a time to warrant any very definite conclusions as to its efficacy, Ridlon states that he believes that the tuberculin injection treatment, guided by the tuberculo-opsonic index is a promising step in advance in the treatment of articular tuberculosis.

Antineoplastic Serum in Cancer.—Doyen (*Rev. de thérap.*, 1907, lxxiv, 469) reports several instances of carcinoma of various parts of the digestive system which have been treated by his serum and draws the following conclusions: Observation shows that the treatment is absolutely harmless, and not only is it able to remove the early symptoms of gastric cancer, but also, in certain instances, the manifestations of pyloric stenosis. Similar results have been observed in a certain number of instances of cancer of the small intestine and colon. To get the greatest benefit from the treatment it should be employed early in the disease and before the patient's vital forces have become vitiated. Results appear satisfactory in three patients. These have been followed for five, four, and three and one-half years, respectively. The author states that he has seen a number of other patients who had been advised to have an artificial anus made on account of malignant rectal stricture, but who, after injections of the anticancer vaccine, were able to pass formed stools of the size of the thumb. He considers diabetes no contra-indication to the treatment, which is essentially that which he advocated in 1901. He, however, no longer employs the serum of immunized horses.

The Treatment of Enteric Fever with Specific Sera Filtrates and Residues. —Richardson (*Boston Med. and Surg. Jour.*, 1907, clvii, 449) summarizes a study of the specific therapy of 130 enteric-fever patients thus: (1) Specific therapy, confined to the original disease, seems to increase the tendency to relapse. (2) By inoculation with Vaughan's non-toxic residue, continued into convalescence, this tendency can be largely eliminated. If relapses can be prevented, then it almost certainly follows that mild enteric infections can be aborted. (3) To get the best results patients must be seen as early as possible in the infection, but (4) an early diagnosis is often impossible, and consequently specific therapy is heavily handicapped. (5) Antityphoid serum is no more effective than filtrates and residues, and is much more expensive. (6) Typhoid filtrates may exert a powerful effect upon the course of the disease, their use being followed in many instances by chills, or rise in temperature, pulse, and respiration, and a general improvement in condition. The nature of these reactions is unknown, but possibly further study, especially of the opsonic index, in connection with these reactions may throw light upon the subject. (7) The non-toxic residue of the typhoid bacillus, as prepared by Vaughan, seems to lengthen the typhoid process, but to render it milder, and is apparently very effective in preventing relapses.

Antidiphtheritic Serum in General Therapeutics.—Mongour (*Jour. de méd. de Bordeaux*, xxxvii, 26, 405) has treated 15 patients suffering from various infections, enteric fever, scarlatina, septicemia, cholecystitis, etc., exclusively with Roux's antidiphtheritic serum, and in all has arrived at most excellent results. No by-effects were observed after the serum injections other than erythemas and arthralgias. In all the patients the betterment in both local and general symptoms was marked and rapid. The dosage varied in the different patients, and repetitions were sometimes necessary. While the relation between the serum and the effect produced was less striking than is the case in diphtheria, nevertheless the effect followed the serum injections with such rapidity as to leave no doubt as to the relation between them. The action of the serum may perhaps be attributable to the hyperleukocytosis which it causes, and the augmentation of the resistance of the organism which accompanies this phenomenon.

The Serum Treatment of Exophthalmic Goitre.—Bulkeley (*Boston Med. and Surg. Journ.*, 1907, clvii, 626) reviews the reported instances of Graves' disease which have received serum treatment, and concludes that we may accept the statement that the palliative action of the serum seems certain, and cure may be possible. Improvement usually begins within seven days; if there is no improvement in three or four weeks the chances are against ultimate benefit. Tachycardia, tremor, and precordial distress show the greatest improvement. Patients without marked goitre, with slight tremor and exophthalmos yield most readily. The weight usually increases, but continued use of the serum may be necessary. A contrast of the different sera offers little of value. The patients treated by Rogers and Beebe by their antitoxin are not included in the review. Of drugs Bulkeley considers quinine hydrobromide the most efficient. If its administration causes a bromic acne, quinine valerinate may be employed as a substitute, and it appears to be nearly as efficacious.

A Polyvalent Antidysenteric Serum.—Coyne and Auche (*Journal de médecine de Bordeaux*, 1907, xxxvii, 705) state that the groups of dysentery bacilli have certain differences, but it is not yet possible to differentiate them with accuracy; for this reason they have thought that an immune serum prepared exclusively from Shiga's bacillus would not have the same action against bacilli of Flexner's group as against those of Shiga, and that the use of Flexner's bacillus in preparing the serum ought not to diminish its curative or preventive power. This polyvalent serum has showed a distinct curative and preventive action in rabbits, and it has given indisputably good results in the instances of dysentery in infants in which it has been employed.

Serum Therapy in Enteric Fever.—Chantemesse (*Klin. therap. Woch.*, 1907, xiv, 1055) has demonstrated that antityphoid serum raises the opsonic power of the blood in typhoid fever, and is very potent as a therapeutic measure. It has been hoped that the administration of the serum would render the employment of cold baths unnecessary, but these latter are very useful in combating the reaction brought about by the rapid destruction of the typhoid bacilli in the organism due to the serum injections. Hence, in his opinion, the treatment of choice in enteric fever seems to be the employment of the antiserum in connection with the application of cold or cool baths.

Sodium Bibromomercurate in Syphilis.—Leredde (*Journal de médecine de Paris*, 1907, xix, 418) concludes that this salt of mercury possesses certain advantages over the other mercurial preparations which are employed in the hypodermatic treatment of syphilis. It is less paniful to the tissues, the dosage being equal, than those which have been proved by trying both agents upon the same patients, and its therapeutic activity is quite as great as other mercurials which are applicable to hypodermatic administration. Its disadvantage—a minor one—is that it must be injected through an iridoplatinum needle.

The Treatment of Hemorrhages in Hemophilia, Purpura, and Allied Conditions.—Weil (*Paris letter, Boston Medical and Surgical Journal*, 1907, clvii, 683) has found that the addition of a little human serum to blood taken from sufferers from hemophilia, causes the abnormalities in the coagulability of the blood to disappear entirely, and has concluded from clinical observations that injections of blood serum are an effectual means, even more so than the administration of the calcium salts, of checking hemorrhage by means of increasing the coagulability of the blood. The treatment consists in injecting 5 drams of serum, preferably human, but that of the horse or rabbit will do, either intravenously or subcutaneously. Cattle serum causes accidents and is debarred. The effect of the injection begins after twelve to twenty-four hours and lasts from one to three months. The method is applicable as a preventive before operation, at long intervals to anticipate hemorrhagic symptoms, and as a curative agent during the hemorrhagic stage of any of the affections mentioned.

PEDIATRICS.

UNDER THE CHARGE OF
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Nephritis in Infants.—Albumin has been found in the urine of healthy infants during the first few days and sometimes weeks by many observers, and the same is true of hyaline, epithelial, and granular casts. G. Carpenter (*Brit. Jour. of Children's Diseases*, 1907, iv, 421), on the other hand, found the urine of newly born infants often free from albumin and tubecasts. In the course of different diseases, particularly pulmonary and gastro-intestinal affections, albumin and casts have been reported in a large percentage of cases, but Carpenter, who has examined the urine of 62 patients coming under his observation for a variety of ailments, found albumin in 2 only. In one, a child of one month, the mother's milk was failing, in the other, a child aged six months, pus cells and desquamated bladder epithelium in the urine accounted for the albumin. The infants examined by him were both breast-fed and bottle-fed. He finds that albuminuria is rare in the œdema of infantile gastro-enteritis. In several instances, in which albuminuria was present with or without tube-casts, and autopsies were performed, the kidneys looked healthy and the microscope confirmed the macroscopic appearance. There was renal inadequacy, but no nephritis. Renal incompetency with a scant secretion of urine is common in broncho-pneumonia. Dropsy in such cases is probably due to retention of chlorides. Experiments have confirmed this theory, as chloride of sodium always diminishes the urine and increases the body-weight, its omission increases the urine and diminishes the weight. If œdema exists without albuminuria and casts, it is improbable that the kidneys are diseased, no matter how extensive the œdema. Nephritis does occur in infants, and occurs particularly often in syphilitic babies. The autopsies in these cases show microscopic changes, and often the macroscopic appearance denotes inflammation; frequently, however, the eye sees no changes, while the microscope may reveal both parenchymatous and interstitial disease. As interstitial nephritis occurs in conditions other than congenital syphilis, the question arises, Is a cirrhotic kidney a syphilitic manifestation, or can a cirrhotic kidney be produced by intestinal toxins?

Heart Complications of Scarlet Fever.—I. H. Eddy (*Amer. Jour. of Obst.*, 1907, lvi, 493) states that he is convinced that the heart has not received the attention it should in the study of the complications of scarlet fever, especially as compared with the kidney. Among 225 deaths from the disease, which he investigated, he found that 130 had various complications; 40 had diphtheria. Simple endocarditis was reported 3 times, ulcerative endocarditis once, acute dilatation three times, dilatation and hypertrophy once, other heart complications thrice. It is not stated how many of these cases had a myocardial affection, but as this is especially to be dreaded in diphtheria, and in scarlet fever also, it is certain that this has been overlooked. The factors which are most likely to produce heart complications are exertion, persistent vomiting, toxemia of complications, rapidly developing anemia, and the action of toxins. Eddy states that the myocardial disturbance is frequently the cause of the nephritis; its low tension leads to passive congestion, which with the aid of the toxins produces the nephritis. The symptoms heralding the approach of a cardiac disturbance are sensation of impending danger, sudden pallor, and at times cyanosis, precordial pain, sudden change from a regular to an irregular pulse, from good tension to almost imperceptible tension, exacerbation of temperature, murmurs, etc. The prevention and treatment are summed up thus: (1) Rest in bed for three weeks as soon as the diagnosis is made, even though the attack is slight. (2) Liquid diet and plenty of water. (3) Antipyretics should not be used; the cold sponge or pack should be employed to reduce the temperature. (4) The oral cavity should receive special attention; toxins are constantly produced there, and adenitis or otitis media may be prevented. (5) The skin should be kept soft and active by baths, carbolated lanolin, etc. (6) The bowels should be kept open by calomel, salines, and colonic flushing. (3) Mild diuretics should be employed. (8) If vomiting persists, all medication should be discontinued for a time.

The treatment includes the following measures: (1) Absolute rest without a pillow. (2) Good ventilation, but no draughts. (3) A good nurse. (4) Diet rich in albuminous foods, as far as the kidneys will permit. (5) Eliminative treatment as given under prevention. (6) The patient should not be allowed to rise up or turn on the left side. (7) For nervousness or restlessness, small or large doses of morphine as the case demands; it is stimulating to the heart. (8) Stimulants under careful and constant supervision. (9) Strychnine is best and should be given in every case. (10) Alcoholic stimulants in doses of ½ dram to ½ ounce. (11) Camphorated oil in emergencies. The nurse should have it ready always, and should be relied upon to know when to give it. (12) Digitalis should not be ordered except when the pulse is very rapid and the tension very low. (13) The icebag should be kept over the heart. (14) The pulse and murmur should determine the time for the patient to get up. (15) The anemia should be treated with peptonate of iron and arsenic.

The Diagnosis and Treatment of Diphtheria in Young Children.—In young children the mortality from diphtheria is still very high and has not been reduced proportionately to that of older children since antitoxin has been introduced. Savage and Goodale (*Boston Medical and Surgical Journal*, 1907, clvii, 698) state that diagnosis by smears is unreliable, being of value only if positive; culture examination is absolutely reliable, but has one fallacy aside from the possibility of error: it takes at least twelve hours before a diagnosis is made. Clinically we can usually recognize a probable case of diphtheria, and mistakes are rarely made; if we wait for the culture report, we have diagnosis security, but the child has less chance of recovery. If suspicious cases are treated as diphtheria, the mortality will be much lower, especially as diphtheria antitoxin is harmless and may be beneficial to patients with tonsillitis, scarlet fever, etc. Very young children rarely have follicular tonsillitis, and therefore a probable diagnosis of diphtheria should be made upon slight evidence; the dangers of waiting are so great that a clinical diagnosis is of first importance and all sufficient for the purpose of treatment. Cultures are of value mostly for the purposes of immunization and quarantine. Concentrated antitoxin should be used, and the initial dose should be 3000 to 4000 units. The dose should be governed by the severity and duration of the infection, and not by the age of the patient.

OBSTETRICS

UNDER THE CHARGE OF

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Alterations in the Umbilical Cord Produced by Syphilis.—Livon (*Ann. de Gyn.*, July, 1907) reports the results of his study of the umbilical cord in cases of fœtal syphilis. He examined the umbilical cord and, whenever possible, the umbilical vein at its entrance into the abdomen. In most cases the alterations were physical in character, inflammatory in nature, attacking the internal coat of the artery. There was proliferation of the connective tissue, with exudate and infiltration with leukocytes. These processes extended in greater or less degree throughout all the tissues of the cord. In many cords endarteritis and endophlebitis with stenosis and partial obliteration of the vessel had developed. A pathological process around the vessels was comparatively rare.

Depression of the Parietal Bone in a Newly Born Infant Relieved by Trephining.—Newton (*Brit. Med. Jour.*, August 10, 1907) describes the case of an infant born in breech presentation with the arms extended over the head. The patient was delivered by the nurse, who extracted the right arm, but a strong pain suddenly expelled the child before the left arm could be brought down.

On examination there was a large depression over the left parietal bone, extending several inches toward the occipitotemporal junction. The anterior fontanelle was almost obliterated and the bones could not be reduced by manipulation. During the next ten days no change occurred and operation was decided upon. The infant was fretful, but there were no signs of paralysis. Under chloroform anesthesia a horseshoe-shaped incision was made around the depression, with the base toward the temporal bone down to the periosteum. This flap was turned downward, a crucial incision was made through the periosteum behind the line of the meningeal artery, and four flaps were reflected. The bone was severed with a trephine, leaving a small bridge at the upper part, where the inner table was left. By reflecting the disc of bone the dura mater with a blood clot upon it came into view. The blood clot was adherent, but as much as possible of it was removed. The bone could not be elevated with a blunt hook without dangerous manipulation; accordingly, the tissues were replaced, the periosteal flaps stitched together, and the skin flap closed. The child was collapsed, but revived by warm saline injection and one-hundredth grain of strychnine hypodermically.

On the fourth day after the operation the dressings had become displaced and were removed, when the wound was found healed. The depression in the parietal bone had disappeared completely, and the anterior fontanelle was normal in size and shape. Stitches were removed on the eighth day, when a callus was found over the disc, which was quite firm. The child made a good recovery.

Chorio-epithelioma Outside the Uterus and Primary Embolic Chorio-epithelioma of the Vagina.—Hicks (*Jour. Obst. and Gynec. Brit. Emp.*, August, 1907) has collected 14 cases of primary chorio-epithelioma of the vagina, in 2 of which the patient died. Secondary growths were found in the lungs, kidneys, and liver, but the uterus escaped. The other 12 patients survived in good condition. The nodules were removed in all cases and a full microscopic description leaves no doubt concerning the diagnosis. Cases are also reported in which the vaginal growth did not appear until three or four years had passed after the expulsion of a blighted ovum. In the patients who recovered the nodules of the vagina had been completely excised.

Hicks also reports the case of a multipara who had pneumonia and who began to have hemorrhage from the uterus. On examination the cervix was dilated and a large hydatid mole, with a five and a half inch dead fœtus, was removed from the uterus. The uterine cavity was found smooth and soft. Pelvic inflammation did not develop, the uterus remained soft and bulky, and there was a blood-stained discharge of dark color. The patient had fever with subinvolution. In the upper portion of the left side of the vagina a cyst developed as large as a small orange, and in the lower portion on the posterior wall a small nodule. This nodule was removed under an anesthetic and twelve days afterward it was found that the cyst had disappeared spontaneously. The uterus had become normal in size, hemorrhage had ceased, and the patient's general condition was very good. There was no vaginal discharge. The patient has remained well. Examination of the nodule showed Langhan's cells in abundance, with syncytial tissue. Villi were absent, but there was much necrosis and hemorrhage around the masses of cells. The structure was typical of chorio-epithelioma.

Some time later the patient was again examined, when a small, soft, but well-defined tumor was discovered in the lower portion of the anterior vaginal wall. This was near the urethra, and in removing it it was necessary to separate the urethra as high as the base of the bladder Tumors continued to appear in the vagina, increasing rapidly in size. The patient finally died with anemia and hemorrhage eleven months after the expulsion of the mole. On examination secondary deposits were found in the right lung. The tissues of the vagina were also infiltrated with the growth.

From the study of this and other reported cases it seems that vaginal chorio-epithelioma often follows the expulsion of a vesicular mole, but may occur after abortion or full-term pregnancy.

Such growths may also occur while the mole is still in the uterine cavity. They originate from the epithelium of embolic villi, and there is no evidence to show that a malignant growth or mole can be expelled from the uterine body, leaving that organ free from growth, while metastatic deposits may occur elsewhere in the body. The growth spreads by the perivaginal veins, and it is impossible to tell whether a given specimen will prove malignant. The presence of a large quantity of syncytial tissue is characteristic of vaginal chorio-epithelioma.

Chorio-epithelioma Complicated by Hematometra.—Griffith and Williamson (*Jour. Obst. and Gynec. Brit. Emp.*, August, 1907) report the case of a multipara who had during pregnancy a blood-stained vaginal discharge with aching pain over the pelvis. Amenorrhœa had persisted for six months; the top of the uterus was but six inches above the pubes. As the uterus did not increase in size, a month later a tent was introduced, followed shortly after by the expulsion of a mole. The uterus remained large, with more or less hemorrhage, which finally ceased.

A diagnosis of chorio-epithelioma was made and abdominal hysterectomy was performed. The uterus was involved and the ovaries were enlarged by multiple cysts of a dark color. The uterus and appendages were removed. When the uterus was opened it was found that the cervical canal was occluded by coagulated blood. Hemorrhage had been prevented by this clot, and blood had accumulated in the uterus, distending its cavity. This accounted for the puzzling feature in the case, namely, the rapid increase in the size of the uterus, accompanied by complete cessation of vaginal hemorrhage. The patient subsequently died from metastases to the lung. Examination of the tumor showed it to be typical of chorio-epithelioma.

Labor Complicated by Calcareous Fibromyoma of the Right Ovary.—Conway (*Jour. Obst. and Gynec. Brit. Emp.*, August, 1907) reports an interesting case of a primipara who was admitted to the hospital with a lower limb of the fœtus protruding from the vulva. The history stated that the patient had been in labor for some days and that her physician had urged her to go to the hospital because of a tumor in the pelvis which made delivery impossible. The patient had declined to go until the fœtal limb appeared. On admission the patient was having strong pains and on examination a hard mass the size of a fœtal head almost completely filled the pelvis. Under anesthesia it was finally possible to push up the tumor and deliver the child. It had been dead for some time. Some weeks after labor the patient returned to the hospital for operation, when a calcareous fibromyoma of the right ovary was removed without difficulty. The patient made a complete recovery.

GYNECOLOGY.

UNDER THE CHARGE OF

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Sarcoma of the Ovary during Pregnancy.—E. Bircher (*Zentrbl. f. Gynäk.*, 1907, xxxi, 1378) says that sarcoma of the ovary is of rare occurrence. The literature shows only a very few cases in which a fibrosarcoma was found during pregnancy. Carcinoma is much more common. The greater number of ovarian sarcomas are of the spindle-cell type. The author makes a detailed report of a case in which a rapidly growing fibrosarcoma of the ovary was removed during the fourth month of pregnancy. There was no recurrence of the disease at the end of three years.

The Surgical Treatment of Inflammatory Diseases of the Appendages.—Giles (*Brit. Jour. Gyn.*, January, 1907, suppl. to vol. xxii, 93) reports a series of 120 cases, as follows: Non-suppurative conditions, 46; deaths, 3; suppurative conditions, 74; deaths, 4. Of the non-suppurative cases, 11 out of 46 were unilateral, and in 3 of the 11 the other appendage had been removed at a former operation. This practically reduces the unilateral involvement in this series to 8 of 46 (17 per cent.). The mortality in the 46 cases was 6.5 per cent. This fact might well give rise to the question of the advisability of ving behind an appendage having a normal or nearly normal appearance when one appendage is removed, when a mortality rate of 6½ per cent. accompanies such operations. Three of the 14 cases were thus subjected, which means that that small number were subjected to the risk of double the mortality, 13 per cent., by being subjected to two operations. It is true that in the non-suppurative class all 3 deaths were in the bilateral cases, 32 in number, a very high mortality rate for non-suppurative cases, yet little comfort can here be found for the unilateral operation. In the suppurative cases 12 were unilateral, with 2 deaths, and 62 bilateral, with 2 deaths. It thus appears that the mortality rate in double suppurative cases (2 in 62), 3.5 per cent., was just twice as good as in the bilateral non-suppurative cases. The large proportion, about 84 per cent., of bilateral suppurative cases also seems to prove the inadvisability of the so-called conservative operations. It is interesting to note that 5 of the 12 unilateral suppurative cases were postpuerperal. This type of puerperal infection is practically always due to the gonococcus, and, as gonococcal adnexal suppuration is practically always double, it would seem as if the unilateral operations for suppurative disease could almost be eliminated. While many surgeons, who have done thousands of operations for adnexal disease, would consider 120 cases as too small a number from which to draw conclusions, yet in chronic conditions Giles' conclusions are fairly sound, judged from the consensus of opinion of the age; but his dread of vaignal incision is at wide variance with the results of great experience and advanced thought.

Cystoscopic Findings in Cases of Vesicovaginal Fistula Healed by Operation.—W. Hannes (*Zentrbl. f. Gynäk.*, 1907, xxxi, 1372) made cystoscopic examinations of 8 patients previously operated upon for vesicovaginal fistula by the method of Kustner, in which the anterior cervical wall is utilized in closing the fistulous opening. In 3 cases no scar was observed. In all other cases there was a flat, more or less broad or radiating, and intensely white scar in the mucous membrane, which had the appearance of having been formed by granulation rather than by healing by first intention. In 4 instances a diverticulum was observed in the region of the scar. Several cases are cited to show that this method of closing a vesicovavinal fistula is not incompatible with a subsequent pregnancy.

Formation of an Artificial Vagina by Intestinal Transplantation.—James F. Baldwin (*Amer. Jour. Obst.*, 1907, lvi, 636) employed this procedure March 22, 1907, on a woman aged thirty-eight years, who had eight months previously been delivered by forceps of her first child. Following delivery complete sloughing of all the vaginal tissues occurred, leaving a sinus so small that passing a probe along it was impossible. The plan followed was to open the abdomen and remove diseased Fallopian tubes. The cul-de-sac was then opened and the vaginal sinus gradually and broadly dilated from above. A loop of the lower end of the ileum was seized with forceps introduced through the vagina, and, having been detached from the rest of the bowel, was drawn down into the new canal, the continuity of the intestine having been restored with a Murphy button. The uterus being quite immobile, rendering suture of the cervix to the intestinal loop impossible, and the reproductive function of the uterus destroyed, this organ was removed. The peritoneum was drawn over the floor of the pelvis. May 1, the septum between the two vaginas was cut with scissors and light packing introduced. August 18, the vagina seemed to be practically normal and showed no evidence of being artificial.

Cystocele.—C. P. Noble (*Jour. Amer. Med. Assoc.*, 1907, xlix, 1982) regards cystocele as a hernia of the bladder into or through the vaginal opening, and as a part of a complex condition consisting of a laceration of the sacral segment of the pelvic floor (perineum), with prolapse of the anterior and posterior vaginal walls and of the uterus. It is Noble's opinion that the tonic condition of the abdominal muscles, intra-abdominal pressure, the proper anatomical supporting ligaments of the uterus and of the bladder, each plays its role in the maintenance of the position of the pelvic orgas, but the greatest factor is the integrity of the sacral segment of the pelvic floor. The exceptions are in cases of marked muscular relaxation of the pelvic tissues, of absorption of the perivaginal fat, of exaggerated intra-abdominal pressure, or a combination of two or three of these factors. Following the suggestion of Hadra, of Texas, that any successful operation for cystocele must be based upon the essential of incising the anterior vaginal wall and separating the bladder from the cervix and vagina sufficiently to permit it to rise in the pelvis, then to resect the anterior vaginal wall to get rid of the excess of tissue, and by following this by suturing the anterior vaginal wall to the anterior face of the cervix, the technique of Noble's method of procedure is as follows: After the uterus has been curetted and the cervix amputated, if necessary, the cervix is drawn down by a volsellum forceps and another volsellum forceps is attached to the anterior vaginal wall near the internal orifice of the urethra. Traction is made on these two forceps and the anterior vaginal wall between them is incised. The tissue on each side of the incision is seized by a forceps for traction purposes and the bladder is separated from the anterior surface of the uterus to above the internal os and from the vagina bilaterally sufficient to permit the bladder to ascend into the peritoneal cavity. The redundant vagina is sparingly excised. The excised portion is oval, with the broader end nearer the uterus. Two rows of buried half-hitch continuous sutures are now inserted, the first embracing the deeper layers of the vagina and catching lightly the bladder wall for the first inch of the incision, and then suturing the deeper layers of the vagina to the anterior surface of the cervix. This is followed by a superficial row. Two or more mattress sutures of chromocized catgut are placed to lessen the strain upon the continuous sutures.

A Simplified Cystocele Operation.—D. Tod Gilliam (*Jour. Amer. Med. Assoc.*, 1907, xlix, 1984) describes his method as consisting of: (1) An oval denudation of the most prominent part of the cystocele, as in the old time operation. (2) Dissecting flaps from the vaginal wall on the sides of the denuded area with which to cover it. (3) Bringing the flaps together over the denuded area and suturing them to it and to each other. The result is: (*a*) The cystocele is effaced. (*b*) The site of the cystocele is strengthened by an additional layer of fascia: that taken from the sides. The technique is as follows:

The redundant tissues along the median line of the anterior vaginal wall are gathered and the line of incision marked out. The crest of the cystocele is grasped by a tissue forceps and a tenaculum is applied above and below the tissue forceps to straighten out the various little folds on either side of the main fold. The main longitudinal fold represents the area to be denuded, and is marked off by pulling it to one side and lightly drawing the knife along its base over the median line from within a half inch of the upper end of the fold to a like distance from the other end. The redundant tissues are now lifted up and by means of the tenacula are gathered into a longitudinal fold along the median line of the anterior vaginal wall. An incision is now made along one side of and at the base of the fold at or near the median line, and extends each way to from one-half inch each end of the fold. Next carry the incision down through the fascia to the vesical muscularis, a similar incision being made on the other side of the fold. By blunt dissection the bladder is separated from the vaginal wall from the incision out to the sulci. The two separate layers of the vaginal wall are converted into flaps by cutting outward from the upper and lower extremities of the incisions toward the sulci. Denude the area between the incisions, but do not remove the fascia, and draw the flaps over the denuded area and suture them to it and to each other from below upward. It is now pulled in the opposite direction and marked in like manner. These lines also mark the internal boundaries of the lateral flaps. These shallow incisions are now deepened to extend through the fascia to the muscularis of the bladder. The bladder by blunt dissection is separated, from the vagina to the sulci and as far as both ends of the incision. The flaps are made by cross cuts from the ends of the incision toward the sulci. The central area is denuded and the flaps drawn over it and sutured to it and to each other. Interrupted sutures are used.

DISEASES OF THE LARYNX AND CONTIGUOUS STRUCTURES.

UNDER THE CHARGE OF

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Pelliculous Sore Throat.—Holmes (*Lancet-Clinic*, September 7, 1907) reports a fatal case of cryptogenic staphylococcic bacteremia in a child, aged nine and one-half years, beginning as a pelliculous sore throat which was presumed to be diphtheritic, although not verified by bacteriological examination, and which had been treated with a series of large injections of antitoxin.

Concretion in the Lymphoid Mass at the Vault of the Pharynx.—Morroway (*Jour. Amer. Med. Assoc.*, September 28, 1907) reports the spontaneous expulsion of a concretion resembling a rhinolith from an hypertrophied Luschka's tonsil in a man, aged twenty-eight years, with atrophic rhinitis, and presenting symptoms apparently identical with those of hay fever.

Foreign Body in the Œsophagus Mistaken for Carcinoma.—Moure (*Annales des maladies de l'oreille, du larynx, du nez, et du pharynx*, July, 1907) relates the case of a man supposed to be dying of inanition under the diagnosis of carcinoma of the œsophagus. Œsophagoscopy revealed an arrested mass of meat completely occluding the œsophagus. This he removed, and the patient recovered rapidly.

Primary Nasal Tuberculosis.—Thrasher (*Lancet-Clinic*, August 17, 1907) reports an additional case with illustrations of microscopic findings. All diseased tissue was removed with the cold-wire snare, cutting forceps, and curette; and the cut surfaces were cauterized with lactic and trichloracetic acid. At the last examination the parts were perfectly free from tuberculous granulations, and the general health of the patient was excellent.

Ozena.—Perez (*Annales des maladies de l'oreille, du larynx, du nez, et du pharynx*, June, 1907) contends that every case of ozena or specific and contagious rhinosinusitis, is developed from another case of ozena or else from the muzzle of a dog; and he supports his views with a summary of 180 cases.

Laryngeal Papillomas in Infants Removed under Direct Inspection.—Van den Wildenberg (*Annales des maladies de l'oreille, du larynx, du nez, et du pharynx*, August, 1907) reports two cases of infants, aged seventeen and eighteen months, respectively, from whom he removed papillomas by direct laryngoscopy. A spasm of asphyxia occurring during the removal of a neoplasm in one of these cases rendered immediate tracheotomy necessary, after which the remaining growths were easily removed a few days later.

Paralysis of the Recurrent Nerve in Tuberculosis.—Fallas (*Annales des maladies de l'oreille, du larynx, du nez, et du pharynx*, August, 1907) reports three cases of paralysis of the recurrent nerve in which radioscopy revealed infiltration of the apices of the lungs, in two cases accompanied by enlargement of the mediastinal glands. In one of these cases, a paralysis of the left side, a severe spasm of dyspnœa necessitated immediate tracheotomy.

Hypertrophy of the Pharyngeal Extremities of the Eustachian Tubes.—Doelan (*Jour. of Laryng., Rhin., and Otol.*, June, 1907) gives an analysis of 14 cases. In all of them the hypertrophy was so marked as barely to allow the finger to pass between the swellings. 10 of them had been sent to a hospital for operation for adenoids by medical men accustomed to recognize the signs of rhinopharyngeal obstruction, but in 4 cases only were there a few small adenoids, and in the rest none.

Tumors of the Pharynx Due to Aneurysms of the Internal Carotid Artery.—Texier (*Revue hebdomadaire de laryngologie, d'otologie, et de rhinologie*, October 12, 1907) adds 2 cases to the 10 he was able to collect in literature. The tumors presented the appearance and consistence of abscess for which, indeed, the first one was mistaken. Digital exploration revealed a pear-shaped contour of the tumor with point downward, but no pulsations were revealed. In the first case, a woman aged seventy-four years, an exploratory puncture revealed the nature of the contents, and the trocar was immediately removed without subsequent hemorrhage, but the tumor enlarged in volume about one-fifth and so remained for two days. On the third day bulbar symptoms supervened followed by coma, and death by syncope ensued two days later. Autopsy revealed the aneurysmal pouch in the tract of the internal carotid about the size of a large hen's egg, with its greater extremity upward. The second patient, a woman, aged forty-seven years, had a growth about the same size and contour, and without pulsation; but with a long metallic stethoscope an aneurysmal murmur could be distinguished synchronous with the first sound of the heart, and a murmur could also be distinguished on the corresponding part of the outside of the neck. This patient was placed upon iodide of potassium with a reservation as to the necessity of ligating the carotid.

Tuberculous Stenosis of the Larynx.—Dupond (*Revue hebdomadaire de laryngologie, d'otologie, et du rhinologie,* August, 31, 1907) reports a case of chronic pulmonary tuberculosis with laryngeal involvement in which, toward the end of life, a double crico-arytenoid arthritis developed with immobilization of both vocal bands. Tracheotomy rendered respiration comfortable until death from gangrenous destruction of tuberculous lesions at the summit of the lungs a little more than a month later.

Stuttering.—Boisveil (*Jour. of Laryng., Rhin., and Otol.,* September, 1907) reports a case of stuttering which disappeared for a few months after each of three successive operations for removal of tonsils and lymphoid growths of the pharynx, and which disappeared completely after section of the uvula without anesthesia.

Castex reported two severe cases of stuttering which had disappeared on removal of lymphoid growths. On the other hand, he had seen a patient acquire temporary stuttering after an operation of this kind.

Nasal Cough.—In a dissertation on nasal cough Lermoyez (*Annales des maladies de l'orielle, du larynx, du nez, et du pharynx,* September, 1907) reports a case of severe obstinate cough of eleven years' duration, which had resisted treatments addressed to the throat and to the nervous system, as well as to a supposed rheumatic diathesis, without effect. Although nasal respiration was unimpeded and topical contact of instruments to different points of the nasal mucous membrane and other portions of the aërial tract failed to provoke paroxysm, the cough was immediately and permanently stopped by the evulsion of a few small pedunculated polypi from the left middle turbinate bone.

HYGIENE AND PUBLIC HEALTH.

UNDER THE CHARGE OF
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Plague and Fleas.—The Plague Commission (*Journal of Hygiene,* September, 1906) has made a report on its experiments upon the transmission of plague by fleas, which establish the correctness of the assertion that the common Indian rat flea, *Pulex cheopis,* plays a part in its dissemination. They placed a plague-infected rat and a number of fleas in a cage enclosed with muslin, and after the death of the rat a healthy rat was introduced into an adjoining cage to which the fleas could gain access. In 11 of 16 experiments with non-immune white rats, and in 19 of 50 with partly immune black or gray rats, the second rat developed the disease. Fleas transferred from rats that had died of plague to healthy rats produced the disease in 21 out of 38 experiments. In the absence of fleas the association of plague-infected animals with healthy ones resulted negatively, but if fleas were present the disease was spread. Examination of fleas (*Pulex cheopis*) having access to plague-infected animals showed an abundance of the bacilli in their stomachs. This flea attacks man as well as rats. They found that the urine of infected rats contained but few bacilli and that the feces are not highly infective; but their blood was found usually to contain enormous numbers, even 100,000,000 per c.c.

The Commission's additional reports (*Journal of Hygiene,* extra number, July, 1907) are of even greater interest than the former. Their studies on the transmission of plague by fleas led to the following sets of conclusions concerning the fate of the plague bacillus in the body of the Indian rat flea (p. 419): (1) The average capactiy of a rat flea's stomach is approximately 0.5 c.mm. On this basis a flea imbibing the blood of a plague rat showing a good septicemia might take as many as 5000 germs into its stomach. (2) Multiplication of the plague bacillus takes place in the stomach of the rat flea. (3) The approximate proportion of fleas in the stomach of which multiplication of plague bacilli takes place has been determined, and it has been shown that this proportion varies with the season of the year, being six times greater in the epidemic season than in the non-epidemic season. (4) Plague bacilli are present in the rectum and feces of fleas taken from plague rats, and such feces are infective to guinea-pigs both by cutaneous and by subcutaneous inoculation. (5) On rare occasions plague bacilli have been found in the œsophagus, but never in any other region of the body, such as the body cavity or salivary glands. (6) During the plague season fleas might remain infective for fifteen days after imbibing infected blood, but during the non-epidemic season no animal was infective after the seventh day. (7) A single rat flea may transmit the disease. (8) Both male and female rat fleas can transmit the infection.

(9) Experimenting with cat fleas (*P. felis*) and human fleas (*P. irritans*), 27 experiments with the former were unsuccessful, and out of 37 experiments with the latter three successes were obtained. Two experiments were made with *C. fasciatus;* both were successful. Multiplication of the plague bacillus takes place in the stomach of the human flea. (10) The plague bacillus has never been seen in the body cavity or in the salivary glands of infected fleas.

Evidence has been obtained to show that the bite of a healthy flea affords a sufficient avenue for infection by septicemic blood if it is spread upon the bitten part. No evidence has been obtained in favor of infection by contaminated mouth parts or regurgitation from the stomach, but the possibility of infection by such means cannot be excluded.

Other experimental studies led to these conclusions (p. 435): (1) Close and continuous contact of plague-infected animals with healthy animals, if fleas are excluded, does not give rise to an epizootic among the latter. As the godowns were never cleaned out, close contact includes contact with feces and urine, and eating of food contaminated with feces and urine of infected animals. (2) When fleas are present, the epizootic, if it does not start, varies in severity and rate of progress according to the season of the year and the number of fleas present. The season in which epizootics were readily produced experimentally, and spread rapidly, corresponds with that of the plague epidemic. (3) An epizootic of plague may occur in a godown containing infected fleas without direct contact of healthy animals and infected animals (Experiments III, IV, V, and VI). (4) In an infected godown the infection is effective in proportion as the test animals are accessible to fleas. (5) Infection can take place without any contact with contaminated soil (Experiments IX to XIV). (6) The experiments exclude aërial infection. (7) The experiments lead to the conclusion that fleas and fleas alone, were the transmitting agents of infection.

Experiments in plague houses in Bombay yielded the following (p. 445): (1) In 19 out of 100 experiments guinea-pigs allowed to run free in houses which were presumably plague infected developed the disease and died. (2) On three occasions, namely, on every occasion of which the experiment was made, fleas transferred from plague-infected rats found in houses infected fresh guinea-pigs in the laboratory. (3) Rat fleas, caught on guinea-pigs in plague houses and transferred to fresh guinea-pigs, transmitted the disease in 35 per cent. of the cases. (4) A census of rat fleas in houses in Bombay, which were proved plague infected, indicated that rat fleas were twelve times as numerous as in control houses; and that in presumably infected houses rat fleas were four times as numerous as in control houses. (5) In 41 out of 130 fleas taken on guinea-pigs in plague-infected houses, bacilli microscopically indistinguishable from plague were found in the stomach. (6) In the case of 24 of the 27 houses definitely proved to be plague infected, dead rats had been found shortly before the experiments were made.

Concerning man as a host of the Indian rat flea the following facts are given (p. 475): We have shown that in the laboratory the rat flea, *P. cheopis*, will readily bite man. When very numerous it will bite man even in the presence of its natural host. We have been able to keep this species of flea alive for more than three weeks by feeding it on man alone. In the course of some experiments in godowns which were infested with *P. cheopis* alone, we have often taken fleas in considerable numbers on the legs of men who have entered the godowns for a short time. In a building in Bombay, in which there had been a severe rat mortality, proved to be due to plague, we have taken rat fleas in large numbers on the legs of men who entered some of the rooms in this building even for a short time. We can conclude, therefore, that the rat flea, *P. cheopis*, under certain circumstances, is attracted by man, and will readily bite and feed on him.

Sewage Bacteria in the Air.—Experiments conducted by MAJOR W. H. HORROCKS, M.D. (*Journal of the Royal Sanitary Institute*, May, 1907, p. 176), to determine whether specific bacteria are ejected into the air by the bursting of bubbles at the surface of sewage showed that, independently of air currents, bacteria will not be ejected thereby to a height of four inches; but with the aid of air currents they may be carried vertically as much as nine feet. Experiments to determine whether bacteria dried on the inner surfaces of (vertical) pipes can be detached by air set in motion through them by sewage flowing through horizontal pipes with which they are joined at their lower ends, yielded positive results. Another series of experiments to determine whether specific bactera are ejected into the air of drain pipes and sewers from sewage flowing under normal conditions seemed to prove a vertical movement of at least eleven and three-quarter feet.

Typhoid Carriers.—On account of the fact that typhoid convalescents may, for a long time, continue to discharge the specific bacilli in their feces and thus act as foci of infection, DRS. SIMON and DENNEMARK (*Deut. milit. Zeit.*, 1907, Nr. 3, p. 86) recommend that, before such persons be detailed to army kitchens, they be subjected to examination at intervals of three days and until five consecutive examinations yield negative results, since otherwise they may, through contact infection, cause explosive outbreaks of the disease.

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ORIGINAL ARTICLES.

THE HYGIENE OF MEDICAL CASES, PARTICULARLY IN HOSPITAL WARDS:

WITH NOTES ON VARIOUS WARD INFECTIONS, AND OBSERVATIONS RELATING TO THE PROBABLE ROLE OF SECONDARY GASTRO-INTESTINAL INFECTIONS IN TYPHOID FEVER.[1]

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In the course of the last five years I have been much interested in watching for evidence of the transmission of infections of various kinds in medical wards; and during the latter half of this time I have been especially interested in the question of prevention, for I have become increasingly convinced that infections occur in medical wards much more commonly than I had suspected, and more commonly, I am sure, than the publicly and privately expressed views of physicians, so far as I am acquainted with them, would indicate.

In considering the circumstances in hospitals with which I am connected, and in others that I have visited, it has seemed to me that the system used in regard to the infectious diseases received in medical wards is usually much looser and less comprehensive than is that used in surgical wards; and that the customs in medical wards should be made to approach more closely to those used in surgical wards. In most of the governing principles, except in regard to the channel of entrance of the infection, the problem is much the same.

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[1] Read in part at the meeting of the Association of American Physicians, Washington, D. C., May 7, 8, and 9, 1907.

It is entirely natural that, when once the beneficence of the aseptic care of surgical conditions had become apparent, there should have been a rapid and enthusiastic progress in improving the methods used for the protection of surgical cases; and that the purpose in view should have at once become the prevention of the conveyance of any infection to any patient, and particularly, in surgical wards, the prevention of the transmission of infection from any patient to another, so far as these purposes could be accomplished through the use of any reasonable measures. It is equally natural that there should have been a feeling that medical infections constitute an entirely different order of things, and cannot be approached in the same way; for different and much more complex circumstances are met with in dealing with them. It is likewise natural that much less attention should have been devoted to the prevention of medical infections, for they are essentially less important than the surgical, because less frequent; but the very fact that they are less frequent has led to an insufficient and a slower appreciation of their actual importance, and to their being less vigorously combated. The surgeon so regularly gets bad results, if his methods are bad, that it has been comparatively easy for him to see his errors and to correct them. The physician gets bad results so irregularly, or infections appear clinically so long after exposure, that their real importance and their sources do not readily become apparent, and bad methods may easily be considered satisfactory.

In recent years there has been such a rapid accumulation of testimony regarding the importance of direct transmission of all sorts of infectious diseases from human being to human being by direct or almost direct conveyance, and there has also been such a mass of evidence of the importance, as carriers of disease, of those who come into contact with the sick and afterward convey the causative agents, even though they do not fall ill themselves, that one may justly suspect that in hospital wards, where numerous persons of reduced resistance, many of them suffering from some infection, are brought together, and where those who care for them go from infected to uninfected, there may be much more frequent transmission of infections than we have believed to be the case. There is great difference of opinion as to the actual frequency of such occurrences, and I may have come to consider them more common than they are.

I do not believe, however, that anyone who looks into the matter in the light of modern studies of the transmission of infections will fail to find that what must, for safety's sake, be considered transmission occurs with sufficient frequency to convince him of its serious importance and of the great desirability of making more comprehensive provision against it than is now done.

To this latter statement I think all those who have already interested themselves in this question will agree. What I have to say refers chiefly to those infections that have until recently been classed as non-contagious or, at most, very slightly contagious. Highly contagious diseases are, of course, subjected to very strict rules. For many years also there have been routine regulations in all well-conducted medical wards regarding some of the most important of the other specific infections. These regulations have especially related to tuberculosis and typhoid fever; to a less extent, to pneumonia; still less, to some other common infections; to some of them, not at all.

FAULTS IN CUSTOMARY METHODS. The regulations ordinarily used may, however, reasonably be considered to be inadequate in at least two ways: First, they refer to only a few of the infections that are frequently received in medical wards; not to all of them. This, again, is quite natural, for diseases of this group were once thought to be rarely, if ever, transmitted directly. We have learned only one by one that many of these may be transmitted; and, as this was demonstrated with the most important diseases, regulations were applied to them. At the present time, however, we may safely say that any infection may be transmitted in a hospital ward if conditions favoring its transmission are present; and I think that anyone who observes the conditions in hospital wards must admit that, for most of these common infections, conditions that at least render their transmission more or less readily possible are often present. Considering the knowledge that we now have, it appears to me that the purpose of regulations in medical wards should be the same as in surgical wards; they should aim to prevent transmission of all infections, so far as this is feasible. This is a much more difficult undertaking than is the proper management of surgical wards, and is much less likely to be generally successful; but it is not to be shrunk from if it is a reasonable proposition.

The second objection to the customary regulations is that they cover only a portion of the means of conveyance, even with those diseases in regard to which especial measures are used; and the means of conveyance that are covered are not always those that are the most important sources of infection to the other patients in the wards.

For example, there are rules regarding the disinfection of the excreta, the bedclothes, and the food utensils of typhoid patients; but there are usually at best only indifferent regulations regarding the hands of the nurses, internes, and visiting physicians who come into contact with both typhoid patients and others. Moreover, the regulations that exist regarding the hands are, as a rule, looked upon as being established chiefly for the protection of the doctors and nurses themselves, rather than of the patients; and they are, therefore, often considered to be more or less voluntary. The excreta, however, even if disposed of without disinfection, are more dangerous to the outside public than to the patients in the wards;

the bedclothes are more dangerous to those in the laundry; and the food utensils, while important, would constitute but a limited source of infection if they were cleansed without actual disinfection; but the hands of the ward staff, especially the nurses, are frequently in contact with the persons, the bedclothes, and the excreta of typhoid patients; and subsequently these same hands are often used to examine or treat the mouths of other patients and to prepare their food. One of the most probable sources of ward infections with typhoid fever is, therefore, ordinarily controlled in a very indifferent manner.

In addition to the reasons that I have given, the regulations in medical wards are very frequently inadequate, because no one in authority knows whether they are carried out or not; and, frequently, neither the visiting staff nor the interne knows exactly what the regulations are or how they are intended to be carried out. Not uncommonly, they are devised by the chief nurse, with at most no more than a hasty approval by the medical staff. This latter point constitutes, perhaps, the most striking evidence that surgeons and physicians look at ward infections from different points of view. The surgeon's system is his chief interest and care. With physicians, however, the system is in frequent instances a matter of comparatively minor interest; and indeed many physicians regard it as being of such slight importance that they do not even know the details of the system used in their wards.

A year ago I had a conversation with a woman whose experience in the conduct of hospitals is unexcelled, in regard to numerous details that have to do with what I may call the aseptic care of medical patients. At the end of the conversation she told me that she had often discussed such matters with surgeons, but had never before done so with a physician. I would at once disclaim any appearance of vanity in mentioning this; I would, on the contrary, adduce it as very direct evidence that, with many others, I had not taken advantage of years of opportunity to go into these matters.

In recent years there has been a much more general interest among physicians than there was before regarding ward infections, as we have more clearly learned the possibility of their occurrence and the frequency with which they can be determined to occur, and some of the details of the hygiene of medical wards have been much improved. It is but just to state that if the matter is inquired into it will be found that the improvements have in many instances been largely due to the initiative of the chief nurses. Physicians have contributed some valuable details, but ordinarily they have offered as the most marked means of advance the more extensive use of isolation; and this measure has been somewhat generally adopted in dealing with pulmonary tuberculosis, and is coming into favor, though not yet frequently used, with typhoid fever.

Isolation an Incomplete Solution. I have the utmost sympathy with the use of isolation in the broadest and most intelligent way possible, and I shall mention the manner in which I constantly attempt to make the best use of it that I can with the means at my command. I feel, however, at the same time, that there is an erroneous tendency to believe that isolation is the most complete and ideal scheme that we can adopt. The use of it largely reduces the chances that those diseases that are isolated will be conveyed to other patients, but it alone will not protect the nurses; and, as I shall indicate, this should be an important part of the system in hospitals. Furthermore, it is a measure that can be applied to very few diseases; and I believe that our first object should be to attempt to devise a system that would reduce the possibilities of the transmission of all infections. In addition to this, even if isolation were possible with all the most important diseases, we should, in carrying it out, collect together groups of patients that, while having the same clinical diagnosis, would by no means be of indifferent influence upon one another. Many of the common infections are frequently complicated by secondary infections; indeed, some of them are in the majority of instances. I believe, for reasons that I shall give, that this is frequently true of typhoid fever, in addition to those diseases in which it is commonly accepted as of importance; and when we consider pneumonia, "influenzal" attacks, tonsillitis, and some other more or less serious common infections, we find that under any of these clinical diagnoses we should, in carrying out isolation, actually be grouping together a number of conditions that bacteriologically are often entirely different diseases. Isolation would, therefore, protect those who are not isolated from those who are; but, unless more detailed precautions were taken, it would not protect those who are grouped together in isolation from acquiring infections from one another. Isolation, then, to my mind, is an extremely important part of a complete system, but it is only a part, and there are numerous details that are not covered by isolation, but that need supervision and regulation.

In order to indicate my reasons for adopting the methods that I now use in my wards, and at the same time to illustrate the character of the regulations that I think desirable, I shall describe briefly some of the experiences that I have had with ward infections. Part of these have already been reported. Most of the observations that I shall especially refer to were made at the Episcopal Hospital, where we have constantly had a large number of cases of infectious diseases in the wards. The conditions there were, as a consequence, peculiarly favorable to observations of this character. The number of instances of transmission of infections that I have been able to observe there is, of course, larger than would be the case in a similar period of time in a hospital in which few such cases are received; but large groups of cases are necessary in order to make evident conditions that would not appear if smaller numbers were under observation. In other ways the conditions in the Episcopal Hospital provide an entirely just comparison with well-conducted hospitals in general; for, in regard to nursing and other circumstances, everything has been quite as satisfactory there as in any of the hospitals with which I am acquainted. Indeed, almost all conditions have been exceptionally satisfactory, beyond the fact that the nurses have, at times, been overworked when unusually large numbers of seriously ill patients were in the wards. I do not think that the infections that I have seen could be attributed to inefficiency or carelessness. On the contrary, they were due, I believe, to errors in the methods customarily used in such wards, and the correction of these errors lies in the power of the medical staff of hospitals, and not with the nurses. I have seen more conditions of this kind recently than I did previously, and more than are usually considered to occur, simply, I believe, because I have carefully and deliberately looked for them recently, not because the conditions were exceptional during this time.

While studying the frequency and importance of ward infections, I have devoted some attention to observing numerous details of the care of patients in various hospitals, and have found it exceedingly easy to discover many ways of greater or less importance in which infections could readily be carried. Indeed, in a few instances, I have found customs that so completely disregarded the most evident opportunities for carrying infection that it would seem that there is sometimes a feeling that medical infections are presided over by a different and more beneficent providence than are the surgical. I have found, for example, in a ward in a well-known hospital, that the duties assigned to one nurse were to disinfect the bedclothes and the excreta, and to prepare the liquid diets.

There are very many ways in which infections may be carried; and, since many different infections are met with, it will be impossible for me to do more than to illustrate the things that seem to me to demand attention first of all, because they constitute the most serious dangers, and to indicate some of the ways in which the danger may be reduced without an unreasonable amount of labor and expense. By giving continued attention to the details of the management of these infections, we can, undoubtedly, learn readily many more things that should be done. The suggestions that I have to make I do not by any means consider perfect or complete. They are in part my own; in part they are used in some other hospitals. Certain types of infections have especially interested me; and they will serve to indicate the chief dangers in medical wards, and also the direction that I feel we should take in attempting to eliminate the most important sources of infection.

The whole matter may most readily be approached by first considering the sources. It is apparent that infections are most likely to occur through the food; through the hands of the doctors and nurses, or other attendants upon the patients; through instruments and food vessels, or other ward utensils, such as bedpans and urinals; or through the atmosphere. There are, I think, a number of very evident ways in which protection against these sources of infection is not provided for by the methods now customarily used, even in the best hospitals.

INFECTION OF THE FOOD. So far as concerns infections, the most important of all foods in hospitals is, of course, milk; and, while much has been written about milk in recent years and some improvement has been made, conditions have actually improved so little that they still, in most institutions, need very earnest attention. In the first place, as to the condition of the milk when received. In hospitals that treat such patients the milk supply for babies and young children has, in many instances, been much improved, though there are still many hospitals that provide for young children milk whose source and hygienic condition are absolutely unknown. The most serious dangers are usually overcome by pasteurization. While this measure has its drawbacks and dangers, it is such a tremendous advance over the use of bad raw milk that it is fairly satisfactory; but it is not comparable to the use in the beginning of a reliable milk, for it is about on a par with simply subjecting soiled dressings from infected surgical cases to a high temperature and then using them with uninfected cases.

With medical cases in more mature subjects the conditions in regard to the milk supply are vastly less satisfactory, and much less has been done to improve them. The conditions in hospitals may, I think, be fairly represented by the following statement: A few hospitals have a supply that is actually known to be good, because it is under the supervision of a medical milk commission, or is regularly supervised by representatives of the hospital, from its source to its delivery. A few have a supply that is complacently called their own, or that is under their own control, but is really very inadequately supervised; and, when actually investigated, the milk is found to be very little, if at all, better than ordinary market milk. The great majority of hospitals, however, obtain their supply simply by contract with a dealer, and they usually know nothing about its sanitary condition when given to the patients, although in a certain number of hospitals more or less frequent bacterial counts are made. If these counts are, as a rule, fairly satisfactory, the milk is considered to be reliable. Unless it is an exceptionally good milk, the counts are frequently found to be temporarily very high, but these high counts are usually passed over as inevitable, and any bad results from the use of the milk are ordinarily not remarked upon. The improvement, therefore, in the character of the milk supply is actually slight; and only a small proportion of hospitals exercise any adequate control over the condition of the milk when it is received, while very few adequately control the hygienic conditions at the dairies and in the course of transportation. These latter matters are much more important than mere bacterial counts. In the first place, a dealer can, by surreptitious pasteurization at a low temperature, keep the bacterial count of a bad milk down to a low point, without its being known that he has done this. While this makes the milk safer if it is well done, it is likely to make it less safe if it is badly done; and often it is badly done. Aside from this, bacterial counts alone are a very imperfect indication of the condition of the milk, for they, at best, indicate only that the total bulk of infection that has reached the milk is small; or, more commonly, they simply indicate that the milk has been kept well cooled. They do not at all satisfactorily indicate how dangerous the infections that are present may be, and they do not demonstrate whether the conditions at the dairy and in the course of transportation are such as to make it improbable that the bacteria producing typhoid fever, tuberculosis, diphtheria, and other specific diseases, as well as the much more common bacteria that produce more or less serious gastro-intestinal disturbances, could gain entrance to the milk in dangerous amounts and are likely to do so with dangerous frequency.

The only ways in which such evil possibilities can in the beginning be reduced to a minimum are, for hospitals: (1) To secure certified milk (and this is usually too expensive, and often impossible because such milk is not available in large quantities); (2) to secure their own dairies, or to have dairies supply them directly, and to have the condition of the milk on delivery controlled by regular temperature records and frequent bacterial counts, and the condition of the dairies controlled by sanitary and veterinary inspection; or (3) to have concerted action taken by medical milk commissions and hospitals, whereby a guaranteed milk that is reasonably sanitary may be supplied to hospitals at a moderately increased cost, the hygienic conditions surrounding its production and delivery being under the continuous supervision of the milk commissions. It is earnestly to be hoped that the latter proposition, which is under consideration by the Association of Medical Milk Commissions, may be adopted. It is the most reliable and the least expensive solution of the question now apparent. Many hospitals would soon be persuaded into acting with the commissions, while others that might be reluctant would be forced into doing so through the general enlightenment that would come from the partial introduction of such a measure. At present, however, this solution of the question is not available; and it will not be widely available for some time, for a number of reasons. One important reason is that, as anyone who has tried to find a suitable dairy for a hospital supply will know, there are now in the neighborhood of most cities very few farmers who could supply milk that would pretty constantly pass as sanitary. Hence the farmers also will have to be led into the movement in large numbers, though this will quickly follow the demand.

I have given this very cursory statement of the situation regarding the milk supply in order to indicate the reasons why, as matters are at present, I have been reluctantly forced to the definite conclusion that, except in those few hospitals in which the supply used is carefully and continuously supervised, and is known to be entirely reliable, all milk that is given to patients that are seriously ill, and especially to patients whose gastro-intestinal tracts need careful management, should be pasteurized, whether the patients be adults or children. I have reached this conclusion reluctantly, because pasteurizing adds trouble in the wards and leads to constipation in the patients, and pasteurized milk often becomes somewhat repulsive to adult patients after a short time. Nevertheless, these are minor objections when compared with the bad results that raw milk may produce.

DANGEROUS RESULTS FROM INFECTED MILK. Some years ago I reported widespread and serious abdominal symptoms in the typhoid patients at the Episcopal Hospital, due to the use of a supposedly good milk, which investigation proved to be actually very bad[2] The abdominal symptoms were reduced from alarming prominence and frequency to an unusual inconspicuousness by merely pasteurizing the milk. Subsequently, the milk supply was changed; and the best supply that appeared to be available, exclusive of the certified milks, which are too expensive to be reasonably used in a large general hospital, was secured by the managers, at an increased expense. Rigid regulations concerning its temperature and bacteriological condition upon delivery, and its care after delivery, were established, and pasteurization was stopped. All trouble with milk appeared to cease for some time; but during my next service, I twice noticed that on one day several typhoid patients developed sharp diarrhœa. Upon inquiry, directly after these occurrences, I learned that Dr. Ghriskey had each time found that the milk yielded high bacterial counts on these days. The counts at other times had run very low. These conditions were transitory; but in December, 1905, diarrhœa developed practically coincidently in a number of typhoid patients in the men's and women's wards; and Dr. Miller and Dr. Stevens, who were then on duty, had the milk pasteurized again, because they got reports for several days from Dr. Ghriskey that the bacterial counts were continually running high. Upon investigation, it was found that the refrigerating plant of the man that supplied the milk was out of order. This had evidently caused the trouble, for high counts continued until the plant was reconstructed. This last-mentioned incident appeared to have serious results, for, as will be shown in the table that I shall give later, there were an unusual number of perforations among the typhoid cases at this time and shortly afterward and serious diarrhœa was, as I have stated, very prevalent.

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[2] New York Medical Journal, March 25 and April 1, 1905.

These experiences make it clear that, in spite of the fact that our milk supply is better than that of most well-managed hospitals, we are at any time liable, and most hospitals are still more liable, to unexpected trouble, which may have very bad results; and this may be due to either the misfortunes or the carelessness of those that produce and deliver the milk. Indeed, everyone who has any knowledge of the milk problem knows that all but the most rigidly supervised milks not infrequently show transitory bad infections. Frequent bacterial counts will not prevent trouble. When such counts are high, they indicate that something is wrong; but this is of little importance except in avoiding subsequent trouble, for the final count is obtained only forty-eight hours after the milk arrives, or at best one knows only after twenty-four hours or thereabouts that a dangerous number of bacteria are present, and meanwhile the patients have taken the milk and the damage is done. Such occurrences can be reduced to a minimum, if hospitals and milk commissions can work in unison in controlling the general hygienic conditions surrounding the production and delivery of the milk. Otherwise, it can be done only at an expense that is impossible for most hospitals to undertake. In the absence of either of these safeguards, I believe that pasteurization is the only reliable measure.

The bad results are not confined to typhoid cases. I have notes of four pneumonia cases in which troublesome diarrhœa occurred at the same time that it occurred in the typhoid cases, in the several periods that I have mentioned, in which the milk was known to have been badly infected. I have likewise noted the same thing with patients of various other kinds, particularly with those whose gastro-intestinal tracts were already disturbed or had recently been disturbed.

It is to be especially observed that pasteurization must be properly carried out if it is to make the milk safe. This remark is not so superfluous as it may seem, particularly in managing large groups of cases, when the pasteurization must ordinarily be done in large bulk. I was recently told that the pasteurized milk that they were using in a ward that I visited appeared to be causing gastric and intestinal symptoms. I went over the various steps used there in the process, and finally took the temperature of the air in the compartment of an ice-chest in which the milk was being "cooled." Two hours after the milk had been placed there the thermometer registered 78° F. The ice-chest was entirely unequal to the task imposed upon it. The trouble was overcome by placing tightly covered vessels that contained the pasteurized milk in large receptacles and surrounding them with cracked ice; it was summer time, and the tap-water was too warm to be of service in cooling the milk. It should be known just what all the details of pasteurization are as the process is carried out in each instance. Bacteriological studies by Pennington, Evans, Bergey, and others have sufficiently shown that poor so-called pasteurization may simply make bacteria flourish.

Care of the Milk after Delivery. The care of the milk does not cease, however, with the points that I have touched upon. Milk may be good when it gets to the hospital, but very bad when it gets to the patient, and some other foods, especially those that are liquid, may likewise become dangerous in the course of their preparation. In the first place, there should be a definite and suitable system of keeping the milk properly refrigerated after it has been received. I have seen milk, after delivery to a hospital ward, stand for an indefinite time in a warm corridor, because it was nobody's especial duty to look after it and nobody had had a good opportunity to do so.

The system that the managers have established at the Episcopal Hospital follows the proper principles very closely. The milk is received by a graduate nurse, who is required to make an immediate record of the temperature of the milk in each can, and then to have it placed at once in the central cooling-plant, where it is kept at a temperature that is regularly recorded and must be below 45° F. The cooling is done by means of freely iced water. The same nurse is responsible for the expeditious delivery of the milk to the various wards, in the amounts and at the times required. At the wards, it is delivered to an especially designated nurse, who is required to see that it is at once and subsequently kept properly cooled, and that it is protected from infection.

Precautions against Infecting Food in the Ward. The latter point is one that is disregarded with surprising frequency. It is, indeed, even more generally disregarded at present than is the condition of the milk on delivery. Everyone is alarmed at once by the knowledge that a person who is coming into daily contact with a case of typhoid fever is working in the dairy from which a milk supply comes; but there is certainly no common concern over the fact that in a very large proportion of hospital wards the general milk supply of the ward is being constantly drawn upon by nurses who at various times soil their hands to a more or less dangerous degree through caring for the mouths, the persons, the excretions, and the bedclothes of patients with typhoid fever, pneumonia, tuberculosis, and a variety of other infections. I have, indeed, mentioned an instance in which a nurse actually had assigned to her as her chief duties the preparation of liquid diets and the disinfection of excreta and bedclothes.

At the Episcopal Hospital we have for some years had one nurse assigned to the sole duty of preparing and delivering to the patients (but not administering) the liquid diets in the medical wards; and this is the ideal system. The enormous importance of infection of the food by nurses who care for the bodies and the various wants of patients has been sufficiently demonstrated by the work of Heubner and other pediatrists, and these observers have, likewise, demonstrated the wonderfully gratifying results that may be obtained by eliminating this danger. The system mentioned has been feasible at the Episcopal Hospital, because we have had there such large numbers of acutely ill patients that the diet-nurse's time was entirely occupied in this way. In any ward, however, it is possible, and is important, that one nurse alone should handle the ward milk supply and any other general supply of food that is not to be cooked subsequently; and the duties of this nurse should not include the care of the persons, the excreta, or the bedclothes of any infectious case, or the handling of any objects that may have been contaminated by such cases.

REGULATION OF THE WORKING PERSONNEL OF THE WARD. Next to the care of the food, the point that appears to me to be of first importance is to establish a system that will reduce the chances that the working personnel of the ward—the doctors and nurses especially, and most particularly the nurses—will convey disease from one patient to another. It is, of course, probable that the mouth is the most important avenue through which infections, when conveyed by them, enter; and in treating patients who are seriously ill, the possibilities, with the system ordinarily used, of conveying infections into their mouths must arrest attention at once. A part of the nurse's duties in such cases is to cleanse the mouth of each patient under her care thoroughly and frequently, and in doing this she may easily carry infection into the mouth; for very commonly she is caring for the mouths, the persons, the bedclothes, and perhaps the excreta, of patients who have non-infectious conditions as well as of those who have infections. She, therefore, has a fruitful opportunity to infect those who are not already infected, and to communicate new infections to those who already have some form of infection. Even when caring for several patients who have the same disease, she may transmit secondary infections existing in one patient to others who previously did not have them. This point has particularly impressed me, both because of the evident opportunities for carrying infection in this way and because it has appeared to me to be the most probable source of some of the ward infections that I have seen.

CARE OF THE PATIENTS' MOUTHS. I have adopted the following system in endeavoring to eliminate trouble from this source:

If she is about to care for patients' mouths, the nurse, before beginning such work, sterilizes her hands, as they are considered to be constantly infected. Indeed, because satisfactory sterilization is difficult to accomplish and would often not be reached, I prefer that she should wear rubber gloves while preparing swabs for the mouth, and also while cleansing the patients' mouths. Before starting to attend to these patients, she prepares, at one time, a sufficient number of applicators wrapped with cotton to make at least two for each patient whose mouth she is to treat. The applicators should be boiled before being used; they are best made of metal, and should be fairly heavy, so that they do not bend easily while in use. The most satisfactory scheme, when such a nurse is available, is to have the diet-nurse, or some other whose duties are such that she does not get her hands infected, wrap the applicators for all the nurses. In cleansing the mouths, the nurse uses one applicator to lift aside the lips, cheeks, etc., and the other, to cleanse with. She avoids touching the lips or the interior of the mouth, or, if she must do so, she at once cleanses her hands again afterward. The soiled applicators are put into a separate receptacle as they are used, and the next patient is then attended to, the whole group needing attention at one time being cared for consecutively. The nurse then removes the cotton from the applicators by means of hemostats, keeping her fingers away from the soiled cotton or metal. In this way, she can, with one sterilization, get her hands clean, and avoid soiling them afterward, while repeated sterilizations between patients would be practically impossible. In case she has at any time to cleanse individual mouths or to make applications to a patient's mouth or throat, her hands should always be sterilized before she begins to wrap the swabs or to treat the mouth, and her fingers should always be kept out of the mouth if possible.

When infectious diseases are present in the wards, and this is nearly always, the same care in treatment as that given an uninfected wound should regularly be given the mouths of the patients. This is often not done. Indeed, in a prominent recent book on nursing, the method of wrapping the finger with gauze that is wet with a mouth wash, and then swabbing the mouth with the finger thus wrapped, is still recommended as the best means of cleansing the mouth. This method is effectual, but is probably, from the standpoint of transmitting infection, the most dangerous that can be used, and I had supposed that it had already been finally condemned.

Visiting physicians and internes have not always a due respect for the mouth as an avenue of infection. I can well remember having examined mouths with entire forgetfulness of the fact that I had shortly before seen patients that had typhoid fever, tonsillitis, or pneumonia, for example, and I still frequently see this done. The hands are sometimes washed, sometimes they are not. When they are washed, it is often done more thoroughly after the examination than before, and it would appear, therefore, to be frequently done from a spirit more of estheticism than of asepsis. I now make it a special point to sterilize my hands before and after examining any patient's mouth or throat, if I must bring my hands into contact with the mouth. I would note incidentally that I also regularly wear a gown in making my rounds, partly because of its moral effect, but much more because I wish to protect my clothing from infection.

CARE OF WARD UTENSILS. The measures that I have just suggested will aid in reducing the extent to which the nurses' hands come into contact with infection. Efforts of other kinds should be made to accomplish the same purpose for the protection of both the nurses and the patients. One prominent way in which this may be done is by boiling all ward utensils frequently, and especially directly after they have been used with infectious cases. Bedpans and urinals, in particular, must constitute a frequent source of trouble, as they are ordinarily cared for. Their contents are disinfected and, to some extent, their interiors, but with the interiors the disinfection is usually only imperfect, and the exteriors are scarcely disinfected at all. Bedpans and similar utensils must carry, much of the time, an extremely varied flora, and frequently a dangerous one. Immersion for some time after use in a disinfecting solution is a fairly satisfactory method, but it is more troublesome and less certain than boiling them. For this purpose, I know of no apparatus so simple and requiring so little trouble as that devised by Dr. Charles P. Noble and for some time used by him at the Kensington Hospital for Women. It consists of a box-like metal receptacle, large enough to contain a number of bedpans, with a faucet for the inflow of hot water, an outlet connected with a drain pipe, and a steam coil in the bottom, the latter being connected with the hospital steam pipes. Hot water can be brought to the boiling point in this within a few minutes, and bedpans and other dirty ward utensils, when made of agateware, can with the greatest readiness be boiled in it as desired, with almost no expense after it has been installed. It takes up very little space.

When thus made bacteriologically clean directly after they have been used, such objects, if handled carefully in emptying them, should be very slight sources of infection for the nurses' hands. In addition to this, although I have not yet insisted upon it, I feel that it is wise to have nurses who are in attendance upon patients with typhoid fever, infectious gastro-enteritis, dysentery, and such disorders, wear rubber gloves (these should, of course, be kept for this purpose alone) in cleansing the persons of these patients, in changing the bedclothes, at any rate if the latter are soiled with discharges, and in bathing the patients. This would eliminate most of the ready opportunities for soiling their hands with infectious material.

There would still remain as a conspicuous source of infection of the hands the necessity for rubbing the patients, and this cannot be done comfortably and well except with the bare hand. It would, however, be comparatively easy for nurses to sterilize their hands regularly after rubbing their patients, as this would require only infrequent sterilization, whereas it is impossible for them to sterilize their hands after each bit of treatment of any sort that they give to the patients. If, therefore, they were protected against all the important sources of infection except that which comes from rubbing the patients, it would be feasible to eliminate this source also pretty thoroughly.

Orderlies should be eliminated from the direct care of patients as much as possible. The administration of enemas and similar forms of treatment should be carried out by the nurse. This is the only means by which danger from orderlies can be prevented, so long as it is so generally customary, as it is at present, to employ cheap laborers, who are often degraded persons, in this capacity. Offering higher wages would improve their quality, but it is questionable whether even then men could be secured who could be trusted with any real care of the sick, for the work is essentially repulsive, and the condition of subordination to everyone else in the ward would be too irksome to most persons of intelligence.

Many physicians will think all these regulations extremely burdensome and a good deal of a tempest over small matters, particularly when so distinguished an authority as Curschmann belittles the danger of ward infection with the most important of the diseases that come especially under these regulations—namely, typhoid fever. They are, however, not actually so difficult to carry out as they sound, and, as to the danger, a vast array of literature in recent years has demonstrated beyond all question the frequency of contact infection with typhoid fever, evidence in most massive form having been given by the report of Reed, Vaughan, and Shakespeare in their report upon Typhoid Fever in the Spanish-American War.

DANGER OF TYPHOID INFECTION OF NURSES. As a direct way of determining the importance of the questions under discussion to nurses and patients in medical wards, let us first consider the effects upon the nurses themselves. This will also serve as an index of the extent to which they may become carriers of infection to patients. In the four years 1903 to 1906 inclusive, we had 14 cases of typhoid fever in pupil-nurses at the Episcopal Hospital. The average number of pupil-nurses in the hospital during this period fluctuated closely around 75. There was, therefore, an average of 3.5 cases a year, and the morbidity among the pupil-nurses was, therefore, 4.66 per cent. During the same period, there were reported in Philadelphia 31,467 cases of typhoid fever—an average per annum of 7877 cases. The population of the city during this time was about 1,500,000. The morbidity of this disease among the citizens in general was, therefore, about 0.524 per cent. Consequently, the morbidity among the nurses at the Episcopal Hospital was 8.9 times greater than among the citizens in general.

At the Pennsylvania Hospital, they had, according to figures kindly furnished me by Dr. Scott, 18 cases among the nurses in nine years, or an average of 2 a year. During each year, they had

60 pupil-nurses in the hospital. Therefore, the average morbidity among the nurses was 3.3 per cent., or 6.3 times the morbidity of the average of the citizens of this city.

In Johns Hopkins Hospital (according to figures kindly given me by Dr. Cole from Dr. McCrae's statistics, which have since been published), they had 15 cases in their total series, that is, in a period of fifteen years, or 1 case a year. Dr. Cole could not give me the average number of pupil-nurses, but since the total of all nurses now ranges from 110 to 120, it appears proper to put the average number of pupil-nurses during this time at about 100. This would give a morbidity among the nurses of 1 per cent. The health reports of the city of Baltimore, kindly furnished me by Dr. Bosley, the Health Commissioner, show, during the ten years from 1896 to 1905, inclusive, 7294 cases of typhoid fever, or 729 per annum. The average population of the city during this period was 528,954. Hence the morbidity there among the citizens in general averaged 0.13 per cent. Consequently, the morbidity among the nurses at Johns Hopkins Hospital was 7.7 times greater than among the outside citizens.

Parenthetically, I would say that, while these figures are striking enough in all three instances, they appear to arraign the conditions at the Episcopal Hospital more severely than those at the two other hospitals, but this is due to the fact that we have had so large a number of cases of typhoid fever in the Episcopal Hospital. During the period that we had 14 nurses ill with the disease (that is, in four years), we had 3230 cases of typhoid fever in the hospital; that is, 1 nurse sickened to every 230 cases received. During the nine years in which there were 18 cases at the Pennsylvania Hospital among the nurses, 4467 patients with typhoid fever were received there, or 1 nurse sickened to every 247 cases. During the time that 15 nurses sickened at Johns Hopkins, there were 1500 cases, or 1 nurse to every 100 cases. Hence a proper comparison indicates that the conditions, while unfortunate enough, were not *relatively* bad at the Episcopal Hospital. They are, however, sufficiently disquieting anywhere, when looked at in the way that I have indicated, and this is, I think, the only proper way of viewing them. The mere absolute number of cases in nurses is not at all a direct indication of the real danger of infection, for the absolute number of nurses anywhere is small. The conditions inside a hospital must be compared with those outside in order to gain a proper conception of the actual dangers.

It may fairly be said that even the figures that I have given by no means represent the danger to those nurses who are chiefly exposed (namely, those in the medical wards), for these figures refer to the total number of pupil-nurses in each of the hospitals. If the morbidity were determined among the nurses engaged in medical wards, it would undoubtedly be much higher. I know of the figures for the nurses working in the medical wards at Johns Hopkins only. Eleven of their 15 cases among nurses occurred among those thus engaged. If it be considered that one-third the nurses are engaged in medical wards (and probably there are usually not more than this), the figures then would be 0.73 cases per annum among 33 nurses, or a morbidity of 2.2 per cent., that is, 17 times the average morbidity of Baltimore citizens in general. The figures become still more impressive when one considers that nurses in hospitals, as well as patients, are much better protected from water-infection than are the outside citizens in general. Pupil-nurses are, of course, in that period of life in which typhoid fever especially occurs, and this is of some importance in explaining their high morbidity. It is, however, far from being a sufficient explanation of these figures.

DANGER OF TYPHOID INFECTION OF PATIENTS. Nurses are then evidently to a most unusual degree, liable to contract typhoid fever. It must be granted that the liability comes chiefly through infection of the hands, and it is impossible to escape the conclusion that they may convey the disease, not only to themselves, but to others. However, the danger to others is less than to themselves because the infection becomes somewhat diluted in transit, and still more because nurses always have opportunity to infect their own mouths, while they have occasion to treat the mouths of only a portion of the patients that they are caring for. I would by no means indicate that I believe that all patients that acquire typhoid fever in hospitals get it through the medium of the nurses. There are a number of other important ways in which they may acquire it, and especially by helping about the ward when they are on their feet, but for those that acquire the disease when they are fast in bed, I think that this is an important source of infection. I have notes of 5 cases of ward infection that I saw in patients at the Episcopal Hospital in the period from 1903 to 1906, inclusive. Three of these occurred in persons that had been confined to bed. Their food was practically beyond suspicion as a source of disease, for it was cared for after the manner that I have described. It seems to me that the next most probable source was the treatment of their mouths. They had all been cared for by nurses who were at the same time giving attention to cases of typhoid fever.

It may, nevertheless, be objected that while it is apparent that the points that I have described as desirable regulations are of importance to the nurses, the number of infections that are known to occur in patients is, at most, too small to justify any very burdensome measures of prevention. Known figures, when properly looked at, do not bear this out, however. As I have said, I saw 5 cases in patients in four years at the Episcopal Hospital. My service there yearly is one-sixth of the total medical service, since six physicians are on duty each year. Owing, however, to the time of year that I serve, I see somewhat more than my share of cases of typhoid fever. While I have not the figures for the experience of my colleagues, I feel that it is safe to consider that, all told, as many as 15 patients acquired typhoid fever in the medical wards in these four years. The number of cases in the medical wards averages about 125. Considering the average number of cases of yearly ward infections in patients to have been 3.75, this makes a morbidity of 3 per cent., or 5.7 times the morbidity of the citizens of Philadelphia in general. In Johns Hopkins Hospital, they have less striking figures, having had but 5 cases in the medical wards in fifteen years, and probably no hospital has a better record than this. These small figures do not, however, actually indicate the degree of danger, for with usually about 100 cases in the medical wards, they have a typhoid morbidity among their medical cases of 0.33 per cent., which is about 2.5 times the morbidity of Baltimore citizens in general. As I have already indicated, patients in hospitals are very much better protected against water infection than are persons outside. These figures also are, therefore, for this reason really larger than they seem; and in addition to this, a few cases probably develop after the patients leave the hospitals in which they acquire the disease, and these would somewhat enlarge the figures. The higher morbidity at the Episcopal Hospital is, again, due not to laxity in methods but to the larger number of opportunities for infection there. We have averaged over 800 cases a year in the period of which I am speaking, while at Johns Hopkins they have averaged 100. Putting aside, however, any question of relative morbidity inside and outside hospitals, I think that there is no doubt that any surgeon who for a series of years had had a yearly average of 3.75 instances of serious septicemias among patients and a similar number among nurses, due to conditions in his wards, would take very active measures to prevent other similar occurrences. The number of cases of typhoid fever in hospitals varies, of course, greatly, but the danger from each case in any hospital is, I think, fairly indicated by the figures that I have given for two representative hospitals.

I may be asked, Would not isolation of the typhoid cases give a much simpler and more certain solution of the question than the details suggested? This would largely protect the other patients from typhoid fever, but it would not protect the nurses in attendance upon the typhoid cases, and this is evidently a matter of immediate consequence. Furthermore, the problem is not one that relates to typhoid fever alone. There is certainly some danger that pneumonia, tonsillitis, and a number of other diseases may be carried in this way, and there is especial danger that various more or less nondescript gastro-intestinal infections may be so transmitted.

I shall mention some instances of the transmission of pneumonia later, and I have some reason for thinking that in a portion of these cases the infection was carried in this manner, but the question of gastro-intestinal infections has especially interested me in this connection.

SECONDARY GASTRO-INTESTINAL INFECTIONS IN TYPHOID FEVER PATIENTS. During several years past I have, particularly, become more definitely convinced that secondary gastro-intestinal infections play an important role in typhoid fever, and I strongly suspect that they are at times introduced in the manner that I have indicated. If I am right in this view, the prevention of such occurrences is a matter of lively interest to the typhoid patients themselves, and if the latter were simply isolated from other patients and no other precautions were taken, they would be in danger of acquiring from one another more or less serious secondary gastro-intestinal infections.

The observations that have led me to this latter viewpoint are purely clinical, and are subject to correction as the result of bacteriological investigation. They are, however, so largely supported by the closely analogous conditions that are known to occur frequently in children's hospitals, especially in infant wards, and they appear to me so suggestive in themselves, that I have little hesitation in describing them briefly and in pointing out rather radical suggestions that must occur to one as a consequence. The train of observations was as follows:

The effects of infected milk in the various instances that I have described and the especially bad results in typhoid patients demonstrated convincingly what is *a priori* to be anticipated: namely, that typhoid patients are especially susceptible to secondary gastro-intestinal infections, and if they acquire such secondary infections the abdominal symptoms become much worse and the disease is, of course, made more dangerous. It is clear, therefore, that if occasion is given for them to enter, secondary infections may play an important role in the disease. In the epidemic of milk infections among typhoid cases that I reported, the effect of pasteurizing the milk was, as I noted at that time, such as to change the picture in the wards from one in which abdominal symptoms were alarmingly conspicuous to one in which they were reduced not only to normal frequency but to so inconspicuous a role that physicians visiting the wards with me remarked upon it as being unusual. With from twenty-five to seventy-five cases of typhoid fever in my wards continuously during my services since that time, I have had many periods, lasting for even weeks at a time, when not a single typhoid patient exhibited hemorrhage, perforation, noteworthy distention, or even diarrhœa that was at all severe. The same thing has occurred with my colleagues.

OUTBREAKS OF DIARRHŒA, HEMORRHAGE, AND PERFORATION. These intervals were broken by periods, which were sometimes prolonged, in which we had constantly a number of cases of more or less severe diarrhœa and distention, and in which hemorrhage and perforation occurred repeatedly, and sometimes in very quick succession in a number of cases. Everyone who has seen large numbers of cases of typhoid fever together has observed such waves of alteration in the character of the group of cases, and I had seen it before, but since the milk has been kept under careful supervision, waves of bad symptoms have excited my attention more sharply, because the periods of freedom have been more striking and more prolonged and have therefore given a better contrast.

These changes are usually attributed to the fact that milder cases are being received at one time, more severe at another. No doubt, this does explain part of the circumstances, but as an explanation for the whole, it is merely begging the question, at best, and it is difficult to understand why the character of a simple typhoid infection should vary so quickly and so frequently in the same community. Furthermore, I especially noted that by no means all the cases that developed bad symptoms were of unfavorable character when they came in, but that, on the contrary, many of them first showed these symptoms when they had been in the hospital for some time. I was also struck by the fact that the change in the character of the cases several times occurred very abruptly. In these instances, in a week after the conditions had been so quiet that no anxiety was felt over any except one or two very toxic cases, we would have a group of cases with very marked abdominal symptoms; and in repeated instances there was a quick succession of cases of hemorrhage or perforation.

Two incidents that I saw, within a few weeks of each other, especially impressed me as pointing to an explanation. In the first, a man, aged forty-four years, of robust frame, was admitted on the tenth day of the disease. He was but mildly ill, had been moderately constipated throughout, and had no special symptoms that aroused the slightest anxiety. An enema was given him thirty-six hours after admission, and he had a formed movement afterward, but a few hours later he developed an offensive diarrhœa with tenesmus, and rapidly became distended. These symptoms continued, and on the next day he had a very severe hemorrhage. He died twenty-four hours later, after repeated hemorrhages, his abdomen having meanwhile become enormously distended. In the bed next to him was a man who before admission already had had an offensive diarrhœa and marked distention. Upon inquiry, I found that the same orderly was in attendance upon both, that the orderly had given the first-mentioned patient an enema; that the rectal catheter through which it had been given had not been boiled before it was used; and that the orderly, as is usually the case with these employés, had not cleansed his hands before administering the enema. The nurses were overworked at this time, and it was necessary for the orderlies to give some of the enemas. Strict orders were, however, given after this as to cleanliness, and the nurses were instructed to boil the catheters themselves before they were used.

Six weeks later another man, who had been in the hospital ten days and had been continuously constipated, developed a sharp offensive diarrhœa within a few hours after having received an enema. The diarrhœa was severe for about a week, but had no more distressing results than to make him more seriously ill than he would otherwise have been. I inquired into this incident also, and, to my chagrin, I learned that exactly the same thing had occurred as in the previous case, owing to the illness of the head nurse of the ward and the confusion resulting from this.

These occurrences made me feel increasingly justified in suspecting that typhoid cases may acquire secondary gastro-intestinal infections from sources other than food. The suspicion was further increased by noting that the stools of those patients who developed diarrhœa at about the same time were, in several outbreaks of diarrhœa, of exactly the same gross character, and quite different from what they had been previously, as well as different from the stools that occur in such patients as the result of what appears to be simple difficulty in digestion, namely their stools were, in some of the outbreaks, deep brown, in others green, and they were strikingly offensive.

APPARENT TRANSFERENCE OF ABDOMINAL COMPLICATIONS. In my services during 1905 and 1906 I devoted especial attention to the sequence of events that occurred when abdominal symptoms appeared in a series of cases. The incidents that I found as a consequence, together with a study of the chronological sequence of hemorrhage and perforation in our wards during these and the two preceding years, have led me to the definite conviction that there is sufficient evidence that special causes of abdominal symptoms may be passed from case to case in typhoid fever to justify us in taking measures to prevent this. There is, likewise, evidence enough to make it very desirable that the bacteriological side of the matter be worked out. The latter has, of course, very great technical difficulties associated with it. Dr. Joseph Evans kindly undertook bacteriological studies of the stools in several cases that developed diarrhœa in two of the periods that I shall describe, and contrasted them with stools from patients without diarrhœa that were in the ward at the same time. In the first instance, however, he was, owing to temporary illness, unable to finish the study; and in the second the results were inconclusive.

Clinically, the sequences were as follows: On April 1, 1905, when I went on duty in the men's wards, I found that of 34 patients who were in the active stage of typhoid fever, 12 had decided diarrhœa, and 5 of them had considerable distention. Within a week, perforation occurred in 5 of the 12 patients with diarrhœa, and 1 had a hemorrhage. Only 1 other perforation had occurred since January

1, of the same year, and there had been but 1 hemorrhage in that time. I looked about for the cause of this and, of course, suspected the milk first, because of my previous experiences; but the milk was in excellent condition at that time. On looking further, I found that the records showed that 3 of the 12 patients had come in with offensive diarrhæa; 2 of these 3 had perforated. The other 9 had developed their diarrhœa one after another within ten days after these three had been admitted.

By April 10 the diarrhœa had subsided, and no patients with typhoid fever in the wards were dangerously ill. No further disquieting abdominal symptoms occurred until April 21, when 2 patients were admitted that had severe, offensive diarrhœa. On April 23, one of these men had a severe hemorrhage; and subsequent repeated hemorrhages caused his death two days later. Meanwhile, beginning April 22 and in the period up to April 29, 8 patients that had previously been free of diarrhœa developed it in some degree—from three to ten movements a day, in the various cases; and of these 8, 6 had severe hemorrhages in the period between May 2 and May 10. Three of these latter 6 died of hemorrhage, and a fourth of perforation.

By May 15 everything had become quiet again among the typhoid cases, and, except for several patients who were very toxic and a number who had slight diarrhœa with curds in their stools, but whose trouble quickly subsided after correcting their diet, there was no trouble up to June 9, except an isolated perforation which occurred, June 8, in a man who had not had diarrhœa. From June 9 to June 11, however, 3 patients were admitted who had decided and persistent diarrhœa, and in 1 of them the movements were very offensive; 3 other patients developed decided diarrhœa within the next week, and between June 14 and June 28 there were 5 cases of hemorrhage, 4 of which were fatal; 3 occurred in patients who had decided diarrhœa, 1 in a patient who was having two loose movements daily, and the other in one who had been having one loose spontaneous movement each day.

My service ended on July 31. In the meantime I saw nothing that I could consider to be evidence of gastro-intestinal outbreaks, beyond the fact that in my last week of service several patients developed diarrhœa of mild character, which had no other serious symptoms associated with it except in 1 case in which fatal hemorrhage occurred. Numerous patients had had some diarrhœa at the time they were admitted; but it was not especially offensive or troublesome in any, and in all of them it subsided in a few days under rigid dieting.

On April 1, 1906, I went on duty again, this time in the women's ward. During the next four months there were no perforations; and, except during a period that I shall particularly mention, there were only the following isolated cases of hemorrhage: April 4 (fatal), April 19 (mild), April 27 (slight), June 18 (fatal). Two of the above-mentioned hemorrhage cases had severe and persistent diarrhœa preceding the hemorrhage. Five other cases were admitted, in the course of the service, with a diarrhœa that was persistent in spite of careful diet and treatment. Numerous others had diarrhœa upon admission, which soon subsided. Except, however, for the one special period which I am about to mention, there were no instances of troublesome or complicated diarrhœa that developed after admission.

The exceptional period was from May 23 to May 30. In this time 6 patients that had severe diarrhœa had dangerous hemorrhages; and 5 of them died. Two of them were among the cases that I have mentioned as having had offensive diarrhœa upon admission. A third had had mild diarrhœa and slight hemorrhage before admission, and both diarrhœa and hemorrhage became more severe after admission. The other 3 developed the diarrhœa soon after the admission of those that already had this complication.

Besides the above-mentioned occurrences, after I had discussed some of these events with my colleague, Dr. Elliston Morris, he directed my attention on July 10, 1906, to the fact that he had in his wards at that time 2 cases with very bad diarrhœa, and 5 others with moderately severe diarrhœa, 2 of them having had persistent diarrhœa since admission. In 1 of these 2 it was exceedingly offensive. The other 5 had developed their intestinal disturbance in the ward, after the admission of the last-mentioned patient.

In all the instances that I have mentioned, the nurses that had the care of the patients that came in with diarrhœa also had to do with patients that subsequently developed diarrhœa. The milk was reasonably well excluded as the source of the trouble in all these instances, for during all of them it was either showing very satisfactory bacterial counts or was being pasteurized; and infection of the milk after its arrival in the wards was also pretty well excluded by the fact that the nurse who had charge of it and of its distribution had no other duties that gave opportunity for her to infect it.

In addition to these instances in which I have described the main course of events, I have, in looking over the records of the cases during 1903 and 1904, been able to determine that three of the little groups of hemorrhage and perforation that show in the chart that I shall subsequently present occurred in association with little outbreaks of diarrhœa that, the records state, developed in the wards. In two, at least, of these outbreaks of hemorrhage and perforation the accompanying diarrhœal outbreaks seem, from a study of the records, to have followed the admission of patients who already had severe diarrhœa; but this is so difficult to determine definitely from simply studying records, especially when their number is so very large, that I cannot be sure of the course of events.

The incidents that I actually observed sufficed, however, to make me feel that most probably infections of the intestinal tract were being transmitted through the wards, and that the outbreaks of hemorrhage and perforation were largely consequent upon this. Considering that the food was an improbable source of infection, and that the mouth is the essential portal of entry, it seems to me highly probable that the infection had been introduced through the care of the patients' mouths; for they were bedfast, and unable to infect themselves through contact with other patients.

THE GROUPING OF HEMORRHAGES AND PERFORATIONS. That hemorrhages and perforations have a striking tendency to occur in groups or sequences has been repeatedly noted by writers. It has been especially remarked in relation to perforation. That this tendency is even more striking than is usually recognized, and that it appears to be due to circumstances existing in particular wards, since these accidents occur in groups in individual wards, seems to be pretty plainly indicated by the chart that I have prepared, which exhibits in their chronological sequence the hemorrhages and perforations that occurred in the men's and the women's wards during the years 1903 to 1906, inclusive, and in the first half of 1907. The total number of cases of typhoid fever during this time was 3677. The chart also shows that the great majority of both the complications under discussion occur in patients that have decided diarrhœa; that they are, therefore, closely associated with evident intestinal disturbance that is not an essential part of typhoid fever. In order that the chart might be simple in form, I have arbitrarily classed as having diarrhœa only those cases in which three or more stools were passed in the day. A considerable number of patients, however, had one or two very loose movements daily, and, therefore, really had diarrhœa; and if these cases were recorded as having diarrhœa, the relation of diarrhœa to hemorrhage and perforation would be still more striking. As the chart stands, however, the figures are: Hemorrhage without diarrhœa, 51; hemorrhage with diarrhœa, 136; perforation without diarrhœa, 15; perforation with diarrhœa, 45. It is apparent, likewise, that diarrhœa was much more prevalent in those that had hemorrhage or perforation in groups or sequences than in those that showed these accidents in isolated instances.

I have included in the chart as hemorrhages all cases in which blood was passed in noteworthy quantities. Mere traces of blood, whether occult or macroscopic, are not included. In order that judgment on this point and others might be uniform, I went over the histories of all the cases myself, in preparing this chart, except for about five hundred cases that Dr. Richard Hooker went over for me.

The next point to which I would direct attention in the chart is that there appear to be an enormous number of hemorrhages and perforations in 1905, and even more in 1906. This is, however, simply because the actual number of cases was extremely large.

In these two years we had 2389 cases of typhoid fever in the hospital, and there were 111 cases of hemorrhage. The percentage in which hemorrhage occurred was, therefore, only 4.6, which is only a little more than half of the frequency of this accident as it is given by most writers. The perforations in these two years numbered 36. They occurred, therefore, in 1.5 per cent. of the cases, which also is distinctly below their ordinary incidence. In the two preceding years the percentages were: hemorrhages, 6.1; perforations, 2.1. These are still below the ordinary averages. I note this in order to show that there was no unusual frequency of these accidents, and that, consequently, there were no exceptionally bad conditions in this group of cases or in the circumstances in the wards which would make the things seen in this series of cases unusual and of no value as an explanation of ordinary conditions.

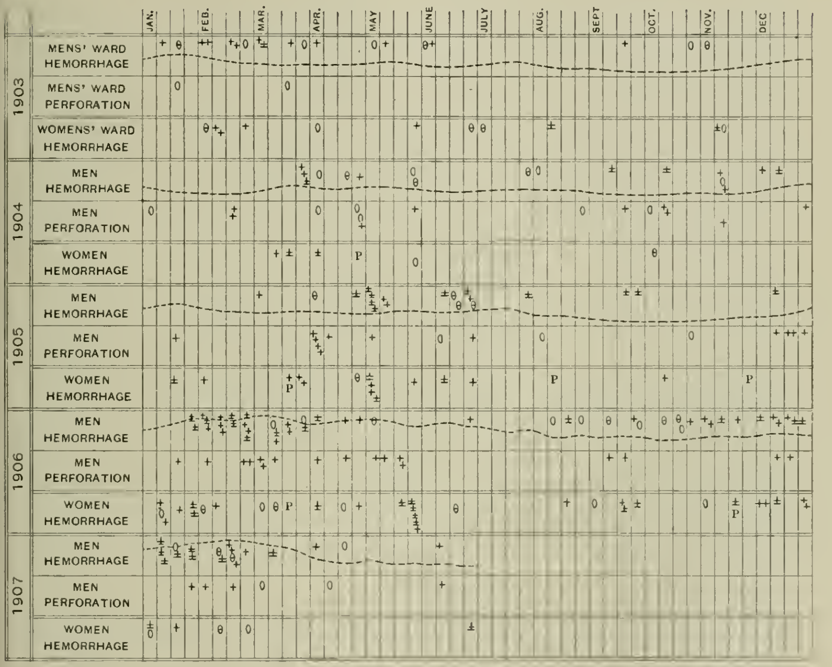

Chart showing the chronological sequence of hemorrhages and perforations in the typhoid fever cases in the men's and the women's wards of the Episcopal Hospital, Philadelphia, from January 1, 1903, to July 1, 1907. The months are divided into fourths (not weeks), in order that the divisions may correspond in the different years. The hemorrhages and perforations in the men are placed in contiguous but separate spaces; the perforations in the women were so few that they are simply indicated by the symbol P in the space for the hemorrhages. The symbol + indicates a non-fatal case with diarrhœa; ±, a fatal case with diarrhœa; 0, a non-fatal case without diarrhœa, and θ, a fatal case without diarrhœa. Fatalities and recoveries in the cases with perforation are not separately indicated, as most of them were fatal.

Since the hemorrhages were much more numerous than the perforations, they give a much more striking picture. What I have to say refers chiefly, therefore, to the hemorrhages, although it applies almost as well to the perforations also; and, as I have said, the two, as they occurred in each ward, should, in this connection, be considered together.

It is at once noticeable that there are remarkable periods of more or less prolonged freedom from these accidents; then there are times when they occur wholly isolated; but the great majority of them occur near one another in point of time, either in prolonged sequences or in rapid succession in sharply demarcated groups. The groups do not show any tendency to occur coincidently in the two wards. In a few instances they overlap, and in one instance particularly, in May, 1905, striking groups were coincident in the two wards. In the latter outbreak, one might properly think that an especial severity of the group of cases that were being received was the occasion of so many accidents, or that the milk had given rise to the trouble; but the milk was in good condition at this time. Milk was, I think, undoubtedly the chief cause of the trouble, in the early part of 1903, in the men's ward; for it was at this time that the epidemic of milk infection that I have described occurred. The milk was probably, in part at least, responsible also for the succession of perforations seen in December, 1905; but, since the same milk was served in the two wards, it could not well be considered to have been the cause of the trouble in the other numerous groups that were not coincident in the two wards, nor can the trouble be well explained in such instances simply through a supposed difference in the character of the epidemic in the community.

The idea will at once suggest itself that the groupings were due simply to there having been exceptionally large numbers of cases of typhoid fever in the hospital at the time when exceptional numbers of accidents occurred. This, however, I think we may accept at once as being not true. To show this point I have introduced the broken line in the spaces for the hemorrhages in men. That running through the year 1906 and half of 1907 indicates the number of cases in the hospital in each week. In the other years I have introduced a similar line to indicate the number of cases admitted to the house in each month. In these last-mentioned years the weekly records of the number of such cases in the hospital were not preserved. The scale of elevation of this line is fifteen cases to each twelfth part of the vertical space. These lines indicate that there is no regular correspondence between the number of cases in the hospital and the number of abdominal complications. When the latter were very frequent there were naturally in some instances a very large number of typhoid cases in the hospital, but the number was, likewise, very large in some of the periods of prolonged freedom from accident, and the relation between the number of cases and the number of complications is wholly variable.

Considering together, then, the facts that these accidents have a striking tendency to occur in groups or sequences, that they appear to occur in one ward at one time and in another ward at another time; that in most instances they occur in persons that have a disturbance of the bowels that is not an essential part of the disease; and, finally, that in a number of instances I was able to trace what appeared to be a clear relation between the admission into the ward of patients with offensive diarrhœa and the rapid subsequent development of diarrhea in a number of patients that had previously been free from it (these patients repeatedly showing either hemorrhage or perforation in groups), I believe that I had sufficient reason to suspect that secondary gastro-intestinal infections produced many, at least, of the outbreaks of diarrhœa and other complications, and that these secondary infections were passed around the ward.

BEARING OF THESE OBSERVATIONS UPON THE GENERAL CONCEPTION OF TYPHOID FEVER. This raises, of course, the still more radical question whether marked abdominal symptoms of any kind, including hemorrhage and perforation, are not ordinarily due to such secondary infections, more than to the typhoid infection itself. The severity of the abdominal symptoms in typhoid fever would then depend less upon the typhoid infection itself than upon the character of any secondary infections in the bowel. This, again, leads to a consideration of the question whether the ulcerative lesions in the intestine that are so nearly a regular feature of typhoid fever are not due to secondary infections more than to the typhoid infection itself, and whether the extent of the ulceration is not dependent chiefly upon the severity and character of any such secondary infections that may chance to gain entrance to the intestinal tract. I am, of course, not justified in going further than to point out the suggestiveness of the conditions that I have described in relation to these points. A definite conclusion in regard to such matters can be reached only by more exact studies, which must be chiefly bacteriological and subject to great difficulties. I may note, however, that these suggestions are, at least, in consonance with the fact that widespread infiltration of the lymphatic tissues occurs in typhoid fever, especially throughout the abdomen, but that destructive lesions in such tissues occur with very great rarity anywhere except in the intestines. There they occur almost always, and it is just there that varied kinds of bacteria are always present, so that the opportunity for some sort of secondary infection is always present. These suggestions are likewise in consonance with what we have learned regarding a number of other infectious diseases, in which the primary infection so often opens the way to a secondary infection that produces the most serious local lesions.

This question has more than an academic interest. Should the above-mentioned suggestions prove correct, we must still expect that abdominal symptoms and accidents will inevitably occur in a certain number of cases, whatever we may do, for a variety of bacteria are always present in the intestines. But the practical bearing of the matter would be that, with strict precautions as to the food and general care of such patients, it would be possible to save many cases from unnecessary secondary infections, especially from those that are severe and dangerous; and it would thereby be possible to reduce the frequency of abdominal symptoms and complications. Indeed, whatever the relation of secondary infections may be to the ordinary lesions of the disease, I am, as I have stated, convinced through my experience with milk infections in typhoid cases, as well as through these observations which so strongly suggest ward-transmission of secondary gastro-intestinal infections, that the at least occasional occurrence of such infections must be reckoned with, and all reasonable precautions must be taken to prevent their occurrence through the food or the general care of the patients, particularly in hospitals, where there are large numbers of opportunities for the transference of such infections.

Pediatrists have learned through most painful experience, especially with infants, not only that milk is of enormous importance in producing infections of this character, but also that there is grave and constant danger of transmitting these infections from child to child. At present, there is no well-conducted infant's ward in which this danger is not combated by careful regulations. In spite of all care, transmissions occur occasionally; and in many such hospitals it is still customary to discharge infants as soon as they are in a condition that makes this at all safe, for fear that they may acquire such infections. The conditions in regard to adults present no essential difference, except that adult patients are ordinarily much less susceptible to such infections. Those adults, however, who are already more or less profoundly ill can hardly be considered to be vastly more resistant to such infections than are infants; and this is especially true of typhoid patients, whose digestive tracts are very easily disturbed. The conditions that I have described are closely analogous to those that occur in infants' wards. The fact that such conditions occur in infants' wards and the necessity for controlling them have, very properly, been accepted without definitely tracing their occurrence by bacteriological methods. The final evidence of their occurrence in these wards or in adult wards, and particularly the evidence as to the exact nature of these infections, must be given by bacteriological studies, but this evidence is not necessary to make precautions with adults seem reasonable, any more than it is with infants.

It will unquestionably be said by many clinicians that my experiences are at best unusual, and therefore not representative of ordinary conditions. This may be true; but it may, at the same time, fairly be urged that I have especially searched for these conditions, and that I have had a most exceptional opportunity for observing a very large number of cases, and, therefore, for seeing things that would not be apparent in observing smaller groups, even though they occurred. The effect of this latter point is seen in the chart. The groups in 1905 and 1906 are very apparent and extremely striking. In 1905, in the men's ward, 21 accidents occurred in three definite groups; 5 others occurred in rapid sequence in December. Only 8 others, all told, occurred in isolated form during the entire remainder of the year, and 2 of these 8 occurred in close succession. The concentration of accidents in the early part of 1906 and 1907 is even more remarkable. In 1904, however, and especially in 1903, in which years the number of cases was much smaller, the groups are not striking. Nevertheless, looked at in the light of the conditions that were met with in 1905 and 1906, it is evident that there were groups, though smaller ones, in 1903, and especially in 1904. In the latter year, there are five little groups, in each of which 3 or 4 accidents occurred in about a week. The total of accidents in these groups was 20. In the whole remaining portion of the year only 12 accidents occurred, and several of these happened very close to the groups, and may have been really a part of the latter; 6 of them, indeed, occurred in pairs. Such occurrences may sometimes be simply coincidence. They may, however, quite as well be due to the conditions that I have suggested, and coincidence is a poor explanation for things that occur in a large proportion of instances, and is likewise an explanation that accomplishes nothing.

TRANSMISSION OF CAUSES OF OTITIS MEDIA. In addition to the matters that I have discussed, there are certain other types of ward infections, and precautions pertaining to them, to which I would refer. It has repeatedly been noticed in groups of sick children, particularly in those who have diphtheria or one of the acute exanthemata, that otitis media occurs with striking frequency, and this has sometimes been attributed, very properly, I think, to transmission of a special infection of the mouth-cavity among the cases at such times. The same thing occurs at times in adult patients that have various diseases, and, in addition to those diseases in which especial involvement of the nose and throat is a typical part of the disease, it is particularly seen in typhoid fever. In 1902 I had 7 cases of otitis media in typhoid cases in the course of two weeks, and in 1906 Dr. Stevens had among his cases a rapid succession of this complication. It is highly probable that when it occurs in a number of cases in the same ward within a short time, the infection causing it is transmitted from case to case, and it is most probably directly introduced into the mouth. The precautions that I have suggested regarding the treatment of the mouth would serve to reduce the frequency with which such infections also can be carried.

In addition to this, the nurses and doctors should, in treating ears that are already involved, adopt similar precautions with their hands, in order to avoid infecting the hands and thus transmitting the trouble. This applies to the treatment of cases of any kind in which otitis develops. It is, however, especially applicable to the wards of those hospitals which care for highly contagious diseases, such as scarlet fever, diphtheria, and measles, in which this complication is very common. In such hospitals, as in general hospitals, patients with the same disease are very often treated as if they were harmless to one another, while, when they have such complications, they almost certainly are not harmless.

INFECTIONS OF THE SKIN. Infectious skin disorders have, likewise, given me some concern. I reported an experience that I had in 1903, in which a very peculiar vesiculopustular skin infection of considerable severity was evidently transmitted to five cases of typhoid fever in the same ward. It was due to a staphylococcus. On account of the situation in which it began in these cases, I suspected that it was carried by the bedpans or was inoculated by the nurses in rubbing the patients. I instituted precautions, which related especially to the disinfection of the exterior of the bedpans, the bath-tubs, and the gauze sponges used in giving sponge-baths; and I required the nurses to take particular care in sterilizing their hands after treating the persons of patients that had any sort of skin infections. This complication did not develop further in my ward, though the infection still seemed to be about the hospital, for it appeared later in another part of the house.

Previous to this I had twice seen a number of patients in succession develop, within a short period, a more or less extensive furunculosis. Since then, also, when I was not on duty, a man was admitted with a number of bullæ of the skin, which became pustular and then gangrenous. Two other patients, near by, developed the same condition within a few days. All three died. This condition, also, was evidently transmitted. More precautions than are usually taken are needed to prevent similar occurrences.

I have, since I saw the little epidemic in 1903, had the nurses that have charge of cases with any infectious skin lesions, even furunculosis, take especial care regarding the sterilization of their hands after treating them, and I prefer that, when looking after such cases, the nurses should wear rubber gloves that are kept for this purpose alone. This is intended to avoid carrying the infection to the skin of other patients (in rubbing them, etc.), and also to avoid the danger of transferring the bacteria from the skin lesions to the mouths of the same or other patients.

I have, likewise, had the gauze used for sponges boiled after bathing any patients, before it is used for others. That which is used for patients with skin lesions is kept for them alone, and the basins employed for sponging such patients are disinfected carefully after their use. The question of the sponges would seem to be scarcely worth mentioning at the present day, but I know that it is often disregarded. Recently, in a prominent hospital in another city, an extremely old marine sponge was seen being used for a typhoid patient, and, upon inquiry, it was learned that it was used with many patients and it was not known that it had ever been subjected to any more drastic measures than ordinary washing. Marine sponges should not be used, for their supposed advantages are theoretical rather than real, and they cannot be successfully sterilized; and gauze sponges, from mere estheticism, as well as for safety, should be boiled after they are used. The boiling of the bedpans and other ward utensils is important also in relation to skin infections, as well as for the reasons that I have already mentioned.

If such cases as impetigo contagiosa appear in the ward, I isolate them and put a special nurse in charge; and I would do the same should any case such as those that I have described as occurring in little epidemics appear. Since I have taken precautions against such complications, I have had no multiplication of cases of extensive furunculosis and no evidence of the transmission of any other skin infection. These infections are rarely grave, though they occasionally are. They are always, however, distressing and, if severe, exhausting to the patient; they sometimes lead to bedsores, if they are in areas that are exposed to pressure; and there is always slight danger that serious general infection may occur from them.

Not less important than any of the conditions that I have mentioned is the proper care of such cases as pneumonia, tonsillitis, "influenzal" attacks, and, of course, tuberculosis. I think, too, that special attention should be given to dysentery and to any cases of gastro-enteritis or colitis that are apparently due to a sharp infection rather than to dietetic errors. So far as any of these require attention to their mouths (and pneumonia and tonsillitis cases always do), precautions similar to those that I have described should regularly be taken, in order to prevent carrying other infections into their mouths, and, likewise, to prevent transference from them to the mouths of other patients. The precautions against unnecessary soiling of the nurse's hands with excretions of all sorts, which I have described as applying especially to typhoid fever, are of importance in these cases also, and they should be regarded with particular care in dealing with all sputum, and with the stools of cases of gastro-intestinal infections. Drinking cups and other food utensils, thermometers, etc., that are employed with any of these cases should be for their individual use, or should be carefully sterilized after being used. Drinking vessels are best made of agate ware, in order that they may be boiled after they are used. The most important further points regarding the care of patients of the type now under consideration I may most readily mention under the general subject of the isolation or segregation of infectious cases.

Isolation and Segregation. Isolation of those infections which are received in general hospitals is, of course, an exceedingly difficult thing to carry out in a satisfactory manner, both because the present-day hospital plants are, as a rule, so constructed that they do not permit of it, and because it is very costly with any arrangement of the hospital, owing to the increased demands for nurses, the extra time consumed in other ways, and for other reasons. The problem that we have to meet is to make the best possible use of the plants that we now have, and to keep within reasonable bounds as to expense. Anything that we do that is at all effectual will cost somewhat more than methods that disregard this precaution, but physicians are quite as well justified in asserting the rights of their patients as are surgeons, and if they are convinced that their demands are just, they may properly insist with equal earnestness upon the insertion of their demands into the hospital budget. We can, however, with our present hospital plants, do much better than is now usually done, without going to very great expense.

In planning isolation and segregation measures, it appears to me that we should not endeavor to obtain simply the most ideal results possible with one or two particular diseases, but should attempt to cover the whole field of action in a manner that, while perhaps imperfect in relation to an individual disease, is such as to offer the greatest general security against all serious infections. I have, therefore, directed my efforts in a manner that differs somewhat from that which is customary at present among many of those who have urged isolation, especially as regards typhoid fever. The principle upon which I have acted is that at present we have little power, except through isolation or segregation, to prevent the transmission of those diseases which appear to be somewhat commonly transmitted through the atmosphere, or which we must at any rate, for safety's sake, still consider to be commonly transmitted in this way. We are in the same position with regard to those diseases which can be transmitted by very brief contact or by kinds of contact that are very difficult to avoid. On the other hand, with those diseases that are conveyed almost solely by means of intermediate persons or objects, or by direct handling of the patients' persons or excreta, we should, by adopting proper measures, be able to reduce the number of infections to so low a point that the danger from these diseases would be decidedly less than from the diseases that are or appear to be frequently air-borne. We cannot, at present, isolate them all; and a perfect system of isolation for all of them can scarcely be looked for in the near future. Indeed, any system of actual isolation of even all those that are of serious consequence will remain, for a long time, at least, a practical impossibility, and with some of them it will, I trust, be found to be unnecessary, for I believe that some of them can be prevented by less rigorous though more detailed measures. I am speaking, of course, of conditions in well-organized hospitals, not of private practice. In the latter, because technical details cannot well be carried out, as a rule, and isolation often can, I believe in regular insistence upon as much isolation of all infections of consequence as one can secure.

Any plan adopted must depend upon the conditions in individual hospitals. That which I have gradually elaborated for my own period of service at the Episcopal Hospital depends upon the means available there. On the men's medical side, we have, on each of two floors, a large main ward, containing thirty-one beds; a small adjacent ward, containing seven or eight beds; and two smaller rooms, one of which will hold two or three beds, the other, four beds. These latter rooms were once used for private patients. They have recently been largely released by the managers for purposes of isolation. The quarters for the women are the same as those on one floor on the men's side, except that there is no small ward. The children occupy the upper floor on the women's side, and the arrangement on their floor is the same as on that for the women. Besides the quarters mentioned, we have heretofore used a series of unoccupied rooms on the upper floor of another building for the immediate isolation of any highly contagious cases that appear in the wards, and we now have a well-equipped isolating pavilion for such cases. On the men's side, the more acute cases are kept on the lower floor, while chronic and convalescent cases occupy the main ward on the upper floor. The side ward on the upper floor is kept for youths, who are best separated from the doubtful moral influence of the men in the ward.

Each day that I visit the wards I survey the situation of the cases in relation to one another, and determine that the arrangement of the cases is the best possible in my judgment, under the circumstances existing at that immediate time. The general plan followed is this:

When febrile cases of doubtful nature are admitted, they are put into the side ward on the men's side, into one of the side rooms in the women's quarters, until it becomes clear that they may safely go into the main ward or that they should go elsewhere. This reduces the danger from cases that would otherwise occasionally spread infections. When the wards are full, all the beds in this side ward are continuously in use, and suitable cases are moved into the main ward, while patients that are disturbing in the main ward (owing to delirium, outcries, incontinence, etc.) are, so far as possible, kept in the side ward, or, if very disturbing, they are put into one of the smaller rooms, if one is vacant.

Placing of Infectious Cases. Cases with recognized infections are placed as follows: Typhoid cases are put into the main ward, and cases of this disease are kept together, other patients not being put among them. Cases with acute gastro-enteric attacks, dysentery, and the like, are put into the side ward, if very ill. If not, they are sent to the convalescent ward. The facilities for caring for those that are very ill are better on the lower floor; but I attempt to keep all such cases as well separated as possible from patients that have any diseases, especially typhoid fever, that render the transmission of such infections to them more probable and more dangerous. Nurses who have charge of such patients are warned to be especially careful about their hands.

Tuberculous patients are put into the four-bed room on the upper floor, this room being regularly reserved for them. It suffices for the number that we receive. It is almost undoubtedly possible to treat tuberculosis in a general ward with practically entire safety to other patients, provided that the tuberculous patients intelligently and conscientiously follow orders; but it is so uncertain whether they will do this or not, and they are so likely not to that I quite agree with the general view that they should be isolated. I think, too, that it is almost equally important on their own accou t to keep them out of the general wards, because "colds," attacks that fall under the group that clinically is usually loosely called influenza, and similar conditions, frequently turn up in the general wards, and tuberculous patients are very subject to these and are frequently seriously damaged by them.

Tonsillitis is rarely admitted. If it is for some special reason, or if it develops in the hospital, the patient is isolated in a separate room and a special nurse is put in charge of the case, both because it is often so difficult to exclude the possibility of diphtheria—and it is important to get this disease out of the ward, even before getting a definite report from the culture—and also because it is not just to expose other nearby patients to tonsillitis, which may be transmitted through brief exposure, and apparently through the atmosphere. If there is no room for actual isolation near the ward, the case, if at all seriously suspicious, is sent to the separate isolating building. If it is only slightly suspicious, the patient is treated in a corner of the L of the corridor, where he can be well separated from the others. If the ward is not very full, and the rooms are occupied, the case may be treated in a corner of the ward well separated from the other beds, a screen being placed around the bed of the tonsillitis patient to keep walking patients away from him. It is probable that the infection is transmitted atmospherically for only a short distance. Therefore, if other patients are kept at a considerable distance and strict care is observed regarding cleanliness of the hands, etc., it is probable that such patients may, with entire safety, be kept in the ward.

Danger from Pneumonia. Pneumonia has especially engaged my attention in regard to the question of isolation. My feeling is definitely that this disease needs to be isolated quite as much as any disease that is admitted to general hospitals, and, beyond all else, patients with pneumonia should be kept away from those who have typhoid fever and other very depressing diseases. I have reported a little epidemic that occurred in my wards in 1903, the cause of which seemed to be clearly that a fatal case in the side ward that was very heavily infected had infected the surrounding area of the ward. The patient had been very delirious and had spat in all directions. The patients who became infected had been near him, but when the infection developed in them most of them had been moved to various parts of the main ward; consequently, it required some investigation to determine the source of the several cases of pneumonia that I found appearing in my ward in this instance. When determined, the side ward was formalized, and the trouble was entirely overcome.

It is perfectly well known that definite ward epidemics of pneumonia occasionally occur. Much of the testimony regarding ward and other epidemics I referred to some years ago[3] and need not repeat. Every clinician of experience has also repeatedly seen individual cases develop in hospital wards, especially in those who are near patients with pneumonia. I have, unfortunately, no definite records of the number of such isolated occurrences that I saw previous to 1903, but I can, from mere memory alone, recall three instances before that time in which typhoid patients developed lobar pneumonia when pneumonia cases were near them, and I can also remember a case of diabetes and one of recent mild apoplexy in which the same thing occurred when the patients were in beds next to pneumonia cases. All these five cases were fatal. Since the occurrence of the ward epidemic that I observed in 1903 I have been using the precautions in regard to isolation or segregation that I shall describe, and—whether as a consequence of this or not, I cannot state—I have seen but two other cases of lobar pneumonia develop in patients in my wards, and one of these occurred after a patient with unrecognized pneumonia had, in my absence, been placed in a bed between two typhoid patients. I have, therefore, no important recent observations of my own that are pertinent to add to these earlier cases. I think, however, some evidence of occasional transmission of pneumonia could be found in any large hospital if actually looked for. In examining the records of the typhoid cases I found casually that in the last week of April, 1904, when I was not on duty in the men's ward, there occurred four fatal cases of lobar pneumonia in typhoid patients within a week, in a limited area of this ward, after pneumonia cases had been placed near or among them. One of my colleagues has also informed me that since that time he has had six ward cases of lobar pneumonia within two weeks, in the same circumstances. I have knowledge, also, of similar occurrences within the last four years in several other hospitals in Philadelphia. In one of these, the pneumonia infections were so numerous and persistent that the ward was closed and formalized. In another (the Philadelphia Hospital), there were so many infections as to lead Dr. Martin and Dr. Biggs to set aside a ward for pneumonia cases. Most of the infections mentioned were in typhoid patients, who are extremely non-resistant to this infection.

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[3] Therapeutic Gazette, 1904

Such infections not infrequently occur in individual cases, and I think that there can be little doubt that ward infections with pneumonia are, all told, as frequent as are ward infections with typhoid fever. They are certainly much more dangerous, for a large proportion of them are fatal, especially when they occur in patients already seriously ill—as, for instance, in typhoid patients. I feel, therefore, that pneumonia, first of all the acute diseases received in general hospitals, should be isolated in some degree. The literature on ward epidemics shows that most of the cases have developed in patients who were near those who had pneumonia. If the patient is tractable, therefore, so that the sputum can be properly cared for, it is very probable that the danger becomes extremely slight if he is kept at a distance from other patients, even though he be still in the same ward, provided that precautions are also taken against transferring the organisms to others by means of the hands of the attendants, the drinking vessels, etc., and that extreme cleanliness is used in regard to the ward floor, etc. Safety in cleansing the ward will probably be greatly furthered through the introduction of the vacuum system of cleaning.

My custom, then, is to place pneumonia cases in one of the rooms near my wards, so long as I have space for all of them there. If I have at one time too many cases of pneumonia, and of other kinds that need isolating, to permit of this with all the pneumonias, I put the mildest and most tractable of the latter in the ward, separating them as far as possible from other patients, especially from those with typhoid fever or other diseases that greatly reduce resistance, and, if there are any vacant beds, placing these between the pneumonia patients and the nearest other patient. I also screen the beds of the pneumonia patients because this probably helps to prevent the spread of infection, and it keeps other patients away from them. It also has a good moral effect upon the ward staff, as a reminder of the need of care. Delirious or intractable pneumonia cases are always kept out of the wards.

Isolation or Segregation of Various other Common Infections. I segregate in the ward, or, if I have space, isolate, cases that develop so-called "influenzal" attacks, whatever bacteria appear to be causative. When diagnosticated as such, they are not ordinarily admitted when such conditions are epidemic, if we can humanely avoid it, because it would be impossible to isolate large numbers. If they must be admitted, they are isolated, if possible, or, at any rate, segregated. So far as possible, I also separate from others in the ward all patients with ordinary "colds." Whenever new cases with any infectious disease are admitted to the ward, I attempt to see myself that the position in which they are placed in the ward or in isolation is the most satisfactory possible in the circumstances existing at that time. I have already noted what I do with skin infections.

I believe that such a system is, under our present working conditions, likely to accomplish more good than simply directing our attention to one or two important diseases and permitting the rest to be mixed up together. I have not followed the recent trend, and attempted to isolate typhoid fever, because I believe that, with the precautions in the care of this disease that I have described, it is probably possible to reduce the danger of its transmission to so low a point that it is very slight, and less than that from those other diseases which I do isolate. I prefer to use my isolation space, first of all, for other diseases, particularly pneumonia. I have also had so many typhoid cases that I could not have isolated them unless the main ward, and often even more space, had been used for them alone, and this would at frequent intervals have left a large part of our space unoccupied, and would thereby have worked hardship to a large number of patients seriously in need of hospital care, who would have been excluded.

In the last half of 1907, the introduction of a supply of filtered water has marvellously reduced the number of our typhoid fever cases. Instead of from 50 to 150, there are now usually from 10 to 20 typhoid cases in the hospital at one time. I may find in future services that I can isolate these cases, and, if so, I shall hasten to do this, but I shall still give preference in isolating to diseases that are apparently capable of being conveyed through the atmosphere. The danger that children may acquire typhoid fever in a hospital ward is, however, so very considerable, and contact infection is so very hard to prevent with any children that are on their feet, that the measures I have suggested as suitable for adults would be much less effectual with them, and with them, I think, isolation should be rigidly insisted upon.

One important way in which adult patients acquire typhoid fever is, undoubtedly, through helping about the ward. While preparing this article I have seen a walking patient carry a bedpan from a typhoid case and immediately afterward start to eat his dinner without having washed his hands. This is an example of common occurrences. Orderlies, who are employed for such purposes, must take their chances, after having been duly warned, but it is not proper to permit patients to endanger themselves in such ways.

APPARENT EFFECTS OF REGULATIONS. My faith in the system of asepsis and partial or complete isolation that I have described is at least not lessened by my experience in recent years, and particularly by my service in 1907 at the Episcopal Hospital, since this paper was prepared. During this latter service I had this system, for the first time, in fairly complete order. While there were, of course, many little ways in which it was imperfectly carried out, I escaped, for the first time, almost all evidence of avoidable ward transmission.

As I have already stated, I had seen no evidence of the transmission of pneumonia infections since I instituted precautions against it, whereas during the several years before that time I had seen evidence of it each year, and in one service I had had a little epidemic. In 1907 I had a large number of cases of pneumonia for some time, but there was no evidence of ward infection with this disease, except in one case. This was the instance mentioned in which a patient with an unrecognized pneumonia had, in my absence, been put for two days among the typhoid cases. Within these same years in the same wards two of my colleagues, at a time when they were placing pneumonia cases among or in proximity to their typhoid cases, had a rapid series of cases of lobar pneumonia in their typhoid cases, and there were, in addition, a considerable number of individual cases.

As to typhoid fever, I had had, in each of the four preceding years, at least one definitely recognized case of ward infection with this disease, in spite of sufficient protection of the food. In 1907 I had no ward infection with typhoid fever. This, however, may have been partly due to the fact that I had only about two-thirds of the number of typhoid cases that I had seen, on an average, in each of the preceding four years.

For three years before, after instituting precautions against them, I had seen no evidence of the transmission of skin infections, and I saw none in 1907. In these four services there had been in the wards a number of isolated cases of virulent furunculosis and two isolated cases of the peculiar vesiculopustular infection that I had previously seen spread rapidly. None of those seen in the past four years spread at all.

In each preceding year I had seen little outbreaks of diarrhœa and sudden groupings of hemorrhage and perforation in typhoid cases; the diarrhœa developed in a considerable proportion of instances in those that had been free from it on admission, and a large proportion of the hemorrhages and perforations occurred in these latter cases. In 1907 I had an exceptional number of typhoid cases admitted with severe and persistent diarrhœa, and I saw no evidence of the transmission of this, and had no groupings of abdominal complications. Indeed, I had only one severe case and two very mild cases of hemorrhage and two perforations, one of the latter occurring unexpectedly in a convalescent. I saw during this time 116 cases of typhoid fever.

This satisfactory state of affairs may have been partly due to chance. I think, however, that it may fairly be considered to have been due in part to the system used.

Protection Against Flies. There are several other points to which I would refer in closing. The danger of the transmission of diseases by insects is now so well known that screens in ward windows and doors are becoming, in well-arranged hospitals, a pretty thoroughly recognized necessity, in order to protect uninfected patients as well as the surrounding community. Even, however, in those wards that are screened one can frequently see many flies, and they, of course, get well covered with infectious material. They should be destroyed as completely and as rapidly as possible.

Division of Work Among the Nurses. Another point that is occasionally of much consequence and that needs supervision is the division of work among the nurses in the ward. I have found a number of instances in which the plan used was very bad. I have mentioned the worst instance, in which the nurse's duties included the preparation of the liquid diets and the disinfection of the soiled bedclothes and the stools. Another arrangement that, because it was less obviously dangerous, is a better illustration of the need of critical supervision of this matter was made apparent through a series of little ward epidemics of diphtheria in the main men's medical ward at the Episcopal Hospital. An investigation of this matter by the staff finally developed the fact that, owing to pressure of work, it had for some time been arranged that a nurse occupied in the out-patient department half the day should spend the other half in helping in the men's medical ward, and this nurse, it was found, was the one who had worked in the nose-and-throat dispensary. In the last outbreak of diphtheria she had evidently carried the infection, for it was learned that she had had a sore throat for a day or two before diphtheria appeared in the ward, and investigation showed her trouble to be an atypical diphtheria. Not improbably, the previous outbreaks had been due to the same cause. Of course, no scheme can be suggested for the nurses' duties that would be suitable in all hospitals. The arrangement in each ward should, however, be known by the visiting physician, and its suitability judged of by him.

More Emphatic Warning of Nurses. Finally, I would urge that greater attention be given to instructing the nurses regarding the very serious danger that they are in from typhoid fever, and that more detailed and constant attention be given to ensuring their use of proper precautions, for they are often exceedingly careless as regards themselves. We have had an unfortunately large number of cases of typhoid fever in nurses at the Episcopal Hospital, and I urged the adoption of some of the measures that I have described quite as much on their account as because of the patients. I think, however, that the figures I have given show that, as compared with the great number of typhoid cases that they have had to care for, and as compared with the figures elsewhere, the number of nurses that we have had sicken with this disease is really gratifyingly small.

This must, I think, be attributed to the fact that Miss Payne, who has been chief nurse during this period, has had a serious and constant sense of the importance of the matter, and has devoted much attention to it. It is, likewise, due to her responsive interest in such matters and to her intelligent direction that I have been able to put into operation the plans that I have had in mind, and I am indebted to her for many suggestions, as I am likewise to Miss Marion Smith, who has adopted many of the same regulations at the University Hospital.

The scheme that I have described may seem somewhat formidable, when viewed as a whole. The regulations do add to the work of the wards, and this cannot be avoided. It is difficult to have them used in satisfactory detail, and I have not yet been able to secure or to demand their use in entirely satisfactory form. This is, however, to be expected, especially at first. They have, in some part, been used for several years past during my services at the Episcopal Hospital, and in chief part during my last service. In considerable part, they have been used for some months past at the University Hospital. The burden that they have caused in these institutions has not been heavy.

I am fully convinced that neither these nor any other systematic regulations will be of much profit to anyone unless the visiting physician takes constant care to determine that the details are carried out continuously and as accurately as possible, in the manner that is best suited to the wards in which he does his work.

THE NATURE AND THE MANAGEMENT OF DIABETES MELLITUS.

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Diabetes mellitus was known to Celsus and Aretaeus in the first century A. D., and was described and named by Galen about 200 A. D.; but though so long recognized its etiology is not even yet perfectly understood. Though often accompanied or perhaps caused by pathological conditions, diabetes is really a disturbance of metabolism, rather than an actual disease as we understand that term.

Diabetes mellitus and glycosuria are not interchangeable terms. The name diabetes mellitus should be restricted to such cases as have sugar in the urine which cannot be removed by any dietetic or medicinal treatment. On the other hand, glycosuria, while a symptom of diabetes mellitus, may be only an indication of functional disturbance, alimentary, nervous, etc.

If this symptom of sugar in the urine is removed by regulation of the diet, hygienic or climatic changes, or by medicinal treatment, the condition is that of glycosuria and not diabetes mellitus, although the fact that sugar readily appears in the urine from indiscretions in diet, or perhaps from normal diet, shows that there is a disturbance of metabolism which we may call, for want of a better term, insufficiency of the pancreas, or, perhaps better, of the organs engaged in sugar metabolism. Such insufficiency in sugar metabolism, or clinically recurrent glycosuria, should be considered a danger signal, as the condition is often a forerunner of real diabetes mellitus.

The principal source of glucose is the carbohydrates of the food. They are changed during digestion into maltose and later absorbed as dextrose; the dextrose goes in the blood to the liver, where it is stored. During the process of digestion the portal vein contains more dextrose than any other blood of the body, thus proving that the liver retains what reaches it and gives it out as glycogen as it is needed.

The muscles of the body, on a mixed diet, contain about 1 per cent. of glycogen, though the muscles of the embryo contain much more, while the liver of the embryo contains but little. The object of this glycogen seems to be to produce energy as exemplified by heat and work; about three-fourths of the heat of the body is produced by the skeletal muscles. It has been proved that glycogen can be made from proteids, and, clinically, we know that in cases of diabetes mellitus the entire withdrawal of sugar and other carbohydrates from the food diminishes but does not abolish the glycosuria. If the carbohydrates are removed from the blood of an animal and the animal energetically exercised, glycogen will disappear from the liver, showing that the reserve glycogen is used for muscle activity. On the other hand, if muscular activity is diminished by narcotic drugs, as chloral, glycogen is again found in the liver, showing positively that it can be made from proteids, but ordinarily not in larger amount than is needed by the muscles. The administration of fat does not increase the amount of glycogen in the liver, but the administration of glycerin retards its elimination and leads to its being stored in the liver.

Some drugs under certain conditions can produce temporary diabetes, such as phosphoric, lactic, and hydrochloric acids, as well as strychnine, phosphorus, arsenic, and carbonic oxide. Just exactly how these drugs cause this glycosuria is not known.

Increased secretion of the thyroid gland may cause sugar to appear in the urine. This is often noticed in Graves' disease, and can often be caused by the administration of thyroid extract.

Disturbances of the central nervous system, especially of the floor of the fourth ventricle or the medulla oblongata, may cause such metabolic disturbance that glycogen in the liver is formed into glucose rapidly and appears in the blood in such quantities that all cannot be used, and hence it is rapidly excreted in the urine, as the blood can tolerate only a small amount of glucose.

It is quite possible that the afore-mentioned acids disturb the liver function, hence the glycosuria; while the strychnine and phosphorus may disturb the nervous system sufficiently to be the cause of the glycosuria; and arsenic is certainly a stimulant to the thyroid gland.

Complete removal of the pancreas is followed by severe diabetes mellitus as well as by the appearance of acetone, diacetic acid, and β-oxybutyric acid in the urine, the latter forerunners of acidemia and coma. If a portion of the pancreas is left *in situ*, or a small piece of the pancreas is transplanted beneath the skin or into the peritoneal cavity, and the rest of the pancreas removed, diabetes does not occur, while if this transplanted portion is later removed, diabetes will occur. Such experimentation positively demonstrates that the pancreas has an internal secretion which plays an important part in sugar metabolism. Unfortunately the feeding of pancreas to animals from which the pancreas has been removed, does not stop the glycosuria.

Experimentation by Herter, of New York, and Croftan, of Chicago, has shown that disturbances of the suprarenal glands may allow sugar to appear in the urine, that is, that massage of the suprarenals or hypodermic or peritoneal injections of suprarenal extract, if in sufficient quatity, can cause glycosuria, even on a starch-free and sugar-free diet. This seems to mean that too much oxidizing stuff, which the suprarenals secrete, is forced upon the pancreatic and liver metabolisms at once and glucose in too large an amount circulates in the blood, the result being its rapid excertion by the kidneys.

Pathologically a large number of cases of diabetes mellitus show disease of the pancreas, and especially the part of the glandular portion of the pancreas which is ductless, the islands of Langerhans. These islands of Langerhans are the part of the pancreas that furnishes an internal secretion or a ductless secretion, a secretion which reaches the blood by absorption. It is quite different from the part of the gland that furnishes the pancreatic digestive juice that reaches the intestines through the pancreatic duct.

Pathologically we cannot always account for the glycosuria that is present in patients who have no apparent histological disease of the pancreas. We must explain these cases on the hypothesis that there is a disturbance in the relationship between a part of the secretion of the suprarenals, the secretion of the islands of Langerhans of the pancreas, and the glycogenic function of the liver cells. If such disturbance of these secretions is permanent or unchangeable, diabetes mellitus develops. On the other hand, if the relationship of these secretions is such that a diminished amount of carbohydrate or sugar can be properly metabolized without too much glucose occurring in the blood and, therefore, appearing in the urine, there is a condition of sugar metabolic insufficiency only. Doubtless, like many other organic insufficiencies, after a period of rest the gland or glands or parts of glands may recuperate or new glandular tissue develop to do sufficient work, and the patient is again able to metabolize the normal amount of starches and sugars.

It should not be lost sight of that reflex nervous disturbances, even if the disturbances are functional, can interfere with these secretions so that sugar may appear in the urine. The disturbance being removed, the sugar will disappear and the recovery may be permanent. Acetone in the urine in any amount is pathological. In starvation and in rigid proteid diet acetone may occur with perhaps diacetic and later β-oxybutyric acids. The free administration of carbodydrates will cause the acetone entirely to disappear, while large amounts of fat and butter increases it, but there is no relation between the sugar excretion and acetonuria in diabetes.

It has been shown that the glycosuria sometimes following ether or chloroform anesthesia and alcoholic intoxication is not due to these drugs, but to some metabolic disturbance caused by them, probably to the dyspnœa, that is, possibly the carbon dioxide poisoning.

It seems to be a fact that the greater the amount of proteid diet, especially with the absence of carbohydrates, the more acetone appears in the urine; the greater the amount of fat ingested the more acetone appears in the urine; while the greater the amount of carbohydrates ingested the less acetone appears in the urine.

The diabetic seems to be unable to derive the proper amount of energy from his carbohydrate food, and, consequently, feels the necessity of eating more proteid and fat, which, if his system is able to digest, keeps up his nutrition. If his digestive or excretory organs become deranged his nutrition begins to fail, as he cannot take enough proteid and fat to satisfy the energy needed and ordinarily produced by carbohydrates, and he then begins to emaciate. It is thus understood why the diabetic eats so much, and why, sooner or later, he emaciates. The enormous excretion of urine seems to be the only cause of the enormous ingestion of water.

The other symptoms of diabetes, such as the tendency to a dry skin and, hence, to eczemas, can be due to the enormous loss of water from the tissues. The predisposition of diabetics to infections is probably due to the fact that the blood, with its increased amount of sugar, is unable normally to produce its opsonins and antitoxins.

Diabetic coma is not due to acetone or glucose, but is due to the diminished alkalinity and finally acid condition of the blood, an acidemia due principally to diacetic and β-oxybutyric acids. The warnings that such a condition is about to occur are headaches, general nervous irritability, and the presence in the urine of one of these acids; quite likely at the same time the amount of sugar and of the nitrogen may be actually diminished. The urine may show at this time a large amount of ammonia, which is probably formed by the increased acids in the urine breaking up the alkalies.

An absolute withdrawal of carbohydrates from the food of patients having true diabetes mellitus will always increase the acetone and diacetic acid and often the ammonia and β-oxybutyric acid, and toxic acidemia and coma become imminent. Hence it is unjustifiable, sugar having been discovered in the urine, to withdraw the starches absolutely or too rapidly from the diet. The condition may be carefully and safely studied by the gradual diminution of starches and sugars and the frequent examination of the urine to see if it is free from diacetic acid, which not appearing, and the carbohydrates being reduced to a minimum and sugar disappearing from the urine, show that the patient is suffering from functional or dietetic glycosuria and not from diabetes mellitus. On the other hand, diacetic acid appearing, the carbohydrates should be increased until it disappears. Also, without the appearance of diacetic acid, if sugar persists in the urine after several days of rigid carbohydrate-free diet, the sugar being formed from the proteids ingested, renders such rigid diet unjustifiable, as the enormous amount of proteids and fats that must be consumed to produce heat and energy so overwork the proteid metabolism of the body as to cause sooner or later serious indigestions, organic insufficiency, and finally organic disease, to say nothing of the danger of sudden acidemia and consequent coma.

While the ammonia in the urine is perhaps the most accurate indication of the diminished alkalinity or the acidemia present, its estimation is chemically much more difficult than the simple test for diacetic acid, which latter will positively indicate the danger of coma occurring.

If a few drops of a 5 per cent. solution of ferric ammonium sulphate is added to the suspected urine, it will cause a crimson color to develop if diacetic acid is present. The more intense and deeper the color, the more of the acid. Diacetic acid being discovered, carbohydrates should be given immediately and in considerable amount, and the coma will generally, at least temporarily, be averted.

Diabetes seems to be on the increase, possibly from our increased nervous tension giving more hours daily and more days a week of nervous tensity, which sooner or later may cause nervous irritability. The Hebrew race seems to be the most predisposed, while the colored race is rarely attacked by the disease, again possibly an indication of the nervous element, there being no race showing more nervous energy than the Jewish, and no race such phlegmatic laziness as the colored. It is a rare disease in infancy, and the tendency and frequency gradually increase until the most deaths occur between fifty and sixty years of age, again the period of exhaustion from continued nervous energy. The disease also occurs more frequently in men than in women. Heredity is an important factor, and is quite frequently an apparent cause in children, while other families show a tendency for it to develop with obesity later in life. Perhaps 20 per cent. of the cases show a family tendency or inheritance.

While it is stated that diabetes mellitus can be an acute disease, I feel that it had better be stated that glycosuria can be an acute serious condition caused by some infection or serious injury, while true diabetes mellitus seems almost invariably to be a chronic disease.

The most frequent complications are those of the skin, as pruritus, eczema, erythema, boils, and carbuncles, while gangrene readily follows slight injuries to the extremities. Ulcerations in the mouth and caries of the teeth occur. There is often loss of the patellar reflexes, and much muscular debility. There may be paralysis of the ocular muscles, and cataract and diabetic retinitis are not infrequent occurrences. Tuberculosis and all infections are readily acquired by these patients.

Without serious complications the disease runs a rapid, fatal course in children, while adults, especially if obese, in which condition the prognosis is the best, may live for years. Death is usually caused by diabetic coma, which is generally preceded by ever increasing indigestions and progressive emaciation.

Treatment. The general management of the case is essential; medicinal treatments are of very secondary importance. The diet should be regulated best to suit the individual case, and this can only be discovered by gradual changes in the diet and frequent examinations of specimens of the twenty-four hours' urine, together with a careful consideration of the efficiency of the digestion and the maintenance of the body weight. Whether or not the patient should remain in the climate in which he is, is a question that can only be settled individually. The proper diet, a modification of mental worries, a modification of work and exercise, with good air, proper warm bathing to keep the skin healthy, perhaps massage, and the discovery that the case is one of glycosuria rather than actual diabetes, may allow a patient to remain at or close to his ordinary life. If, on the other hand, the case is one of diabetes mellitus and there is the money ability or opportunity to move to a warm climate which is not subjected to great changes of temperature, the patient should be advised to take advantage of such ability. Experience has shown that sudden changes from warm to cold and excessive muscular exercise, as is also true in chronic nephritis, may precipitate a diabetic coma in the one instance and a uremic coma in the other. Hence, we should cause our patients to defend themselves as much as possible from these dangers.

The actual diet or the gradual modification of the diet is too well understood to require more than brief mention. As we diminish the carbohydrates and heat-producing substances, we must add fats in the form of butter, cod-liver oil, or pure olive oil, if it can be secured. I have not a doubt that many a patient with diabetes mellitus has been hurried to his grave by rigid starch-free diets. I also believe that the fraudulent fact that most so-called starch-free gluten foods contain starch has allowed many a diabetic to live months longer than a starch-free diet would have allowed. My own method of diet is to remove all starches and sugars except bread for a time; to allow at first plenty of bread, and then gradually to reduce it, depending upon the amount of sugar in the urine and whether or not there is diacetic acid. If diacetic acid does not occur and the sugar continues to diminish, I reduce the bread to a minimum. If I find that a certain percentage of sugar continues in spite of the diet, I find the amount of starch that is needed to keep the patient from hunger and prevent him from eating enormous amounts of proteid and to keep up his weight. I then may allow him a slice of bread at each meal, or he may substitute for the bread a potato, allowing him to eat only a certain small amount of starch at each meal. If he complains of feeling cold, as patients on such a diet often do, I may even allow him an occasional lump of cane sugar, acting on the theory that if his metabolism continues to produce glucose from proteid, he had better have some starch or sugar to produce it easily and perhaps satisfy the mal-metabolism with less disadvantage to the system. As above stated, if diacetic acid is found in the urine, the starches should be increased immediately until it disappears. Potatoes are often more perfectly metabolized by glycosurics than are breads.

As to the feeding of organic extracts, the only ones to consider would be pancreas and suprarenal. I have never found any results from feeding pancreas. I have sometimes found good results from feeding suprarenal tablets, two, three, or four three-grain tablets a day. I have never been able to eliminate the sugar from the urine in a true case of diabetes mellitus by giving the recommended digestive ferments, although it is quite probable that some of the best of these ferments will allow a patient with alimentary glycosuria to digest and tolerate more carbohydrates than could otherwise be used without glycosuria occurring.

Various drugs have been found to modify the sugar excretion in diabetes, such as salicylic acid, salol, antipyrine, and various benzoate and guaiacolate combinations, but as no one of these drugs can be taken for any length of time without doing harm to the system, any temporary decrease in the amount of sugar is a matter of unimportance. Certain it is that prolonged use of these drugs will do harm.

I cannot believe that arsenic, which has been recommended, is often if ever justifiable. Personally, I have found it to do more harm than good. Opium, or one of its alkaloids, as morphine or codeine, often reduces the excretion of sugar, but it is also a sure method of causing the opium habit, and as soon as we understand that it is not the excretion of sugar in the urine that is doing the patient harm, we will not use such drugs to diminish that excretion, that not being the disease, but only an indication of it. The action of morphine when taken for a long time has been shown to be probably upon the suprarenal glands. Profound poisoning by morphine seems to inhibit the activity of these glands, hence, repeated doses probably act mildly and continuously upon them. While this may reduce the formation of glucose, it can probably rarely, if ever, modify the course of the diabetes, and certainly adds many uncomfortable symptoms, such as increased dryness of the skin, loss of appetite, constipation, and all the nervous discomforts of the morphine habit.

It diabetic coma is imminent, besides pushing the carbohydrates, alkalies should be given, and there is probably none better than the simple bicarbonate of sodium. The danger being passed, simple alkaline mineral water may be administered for some time, especially if the bicarbonate of sodium causes indigestion. If coma has developed, venesection and the withdrawal of considerable blood, and then the administration intravenously of bicarbonate of sodium solutions, has caused the awakening of the patient; but there seems to be no permanent cure, the patient again relapsing into coma, in from twenty-four hours to two or three days. Physiological saline solution has been found as valuable as the bicarbonate of sodium solution for this purpose, while the alkali may be administered by the stomach or rectum.

THE IMPORTANCE OF THE EARLY DETECTION OF ANEURYSM OF THE AORTA.

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The attitude of the general practitioner today toward thoracic aneurysm may be compared to his attitude a few years ago toward the recognition of pulmonary tuberculosis—he was satisfied to recognize the disease when it was fully developed. It was not altogether his fault, but rather that of the text-books, which, in giving a single picture of the whole disease, naturally described the typical or developed cases. These cases must be regarded, in tuberculosis or aneurysm, as in the advanced stages, and as very hopeless from the point of view of treatment.

We have learned our lesson in tuberculosis. We now know the importance of recognizing it in its incipient stage, when we can greatly benefit, and often cure, our patients. This matter has been presented to the profession thoroughly, and the picture of tuberculosis that the general practitioner carries in mind today is of the incipient or early stage of the disease—not the advanced stage. He is eager to recognize this early stage, and, as a result, the numbers of "arrested" or "cured" cases are multiplying rapidly.

Aneurysm of the aorta is not as common a disease as tuberculosis, but it is even more hopeless, and it causes great suffering. It is the more hopeless in proportion as it is advanced. Consequently, if we are to benefit our patients, we must discover it early—the earlier better. It may be noted in passing that aneurysm of the arch of the aorta is much more common than is generally supposed.

I have drawn a comparison with tuberculosis not because it is as important a disease, nor because the two diseases are similar, but because the general practitioner has been taught to do today for tuberculosis just what I hope to see him do in the future for aneurysm. He is keeping tuberculosis in mind; he is improving his technique; he makes careful examinations of the chest with the disease in mind, and he realizes the importance of its early recognition. It requires no more training or skill to recognize aneurysm early than it does in the case of tuberculosis. Therefore there is no reason why it should not be detected early, if the general practtioner will only keep it in mind and will examine with the same thoroughness as he does for tuberculosis.

Some forms of aneurysm cannot be recognized in their early stages. This is especially true of those situated at the very beginning of the aorta, at or just above the sinuses of Valsalva. When small, they give no symptoms and cannot be distinguished by physical examination. By the time they get large enough to be so distinguished they usually rupture into the pericardium, and sudden death is the first evidence of their presence. Aneurysms of the descending arch and the descending thoracic aorta can rarely be recognized in an early stage. This is due partly to their location deep within the chest, where they are inaccessible to physical examination, and partly to the fact that no important structures are pressed upon until the aneurysm has attained a considerable size, and until this point is reached there are no symptoms. Therefore, they are advanced when recognized clinically.

From a clinical standpoint, then, we are concerned essentially with aneurysms of the ascending arch and of the transverse arch. These are accessible to physical examination, and they can be detected much earlier than is generally supposed. Moreover, this part of the aorta is the commonest site of aneurysm.

As in the case of most diseases, the recognition of the condition will be based partly on symptoms and partly on physical signs. There is a difference between aneurysms of the ascending arch and those of the transverse arch in this respect, as pointed out by Broadbent. In the case of the ascending arch the aneurysm is near the surface, and easily accessible to physical examination. It is, moreover, surrounded by structures that can easily be pushed to one side without serious results. Consequently, symptoms from pressure rarely arise until the aneurysm has attained considerable size. In the earlier stages, therefore, we detect these cases by physical signs rather than by symptoms, and Broadbent calls these aneurysms of the ascending arch the "aneurysms of physical signs." In the same way he speaks of the aneurysms of the transverse arch as "aneurysms of symptoms." These latter are more deeply situated and are less easily detected by physical examination. Before they get large enough to be easily detected by physical signs they press upon some of the important structures by which the transverse arch is surrounded and thus give rise to early symptoms.

Percussion furnishes the most important of the physical signs of aneurysm of the arch of the aorta in the early stages. When inspection and palpation are of use, the aneurysm must have reached the chest wall—and is already in an advanced stage. I wish to emphasize this point, that it should be our aim to detect aneurysm of the aorta *before* it is visible or palpable—even by the most careful examination. Auscultation is of little value as commonly employed. The physician is too apt to base his decision on the presence or absence of a systolic murmur over the site of the suspected aneurysm. A murmur is frequently absent, even when the aneurysm is large, and one of the few dogmatic statements that can be made about aortic aneurysm is—*never* exclude aneurysm because a murmur is not heard.

The importance of percussion in determining an enlargement of the arch of the aorta is shown by the fact that by practice we can determine the outlines of the right side of the arch fully as accurately as we do the outline of the left border of the heart. We can do this in a normal individual, and it is naturally easier when an aneurysm is present, which brings the vessel wall nearer to the surface. For this purpose percussion must be extremely light; otherwise the bony structures of this region are thrown widely into vibration, and our note is that of the sternum and ribs backed by the resonating power of the air-filled lung tissue. Very light percussion is all that is necessary, because the aorta lies near the anterior chest wall. Percussion in the interspace is preferable to that over the rib. Before accepting aneurysm as the cause of a change in the percussion outline, we must remember that deformity of the chest or spine may cause displacement of the aorta to the right, or retraction of the lung tissue may leave it uncovered to an abnormal extent.

Under normal conditions the transverse dulness at the level of the manubrium extends 2 or 3 cm. to the right of the median line of the sternum, and 1.5 to 2.5 cm. to the left of the median line. The total transverse dulness is 4 to 5 cm. We may consider anything above 5 cm. as more or less abnormal and requiring consideration. On the right we can make out a curved line of dulness in the adult, as characteristic in outline as either border of the heart. If this border of dulness is farther to the right than normal, and if the normal curve is increased, we know there is an abnormal condition of the aorta—probably an enlargement or aneurysm.

The aorta is nearest the anterior chest wall at the junction of the second right interspace with the sternum. From this point, as it arches over to the left, it also plunges deeper into the thoracic cavity, and soon gets beyond the reach of percussion. Consequently, dulness does not extend normally as far to the left of the median line as it does to the right. It is usually about a centimeter less. Neither is the boundary of dulness as definitely shaped on the left. It can easily be understood that any enlargement of the transverse arch may bring its wall nearer to the anterior wall of the chest. The dulness on the left of the manubrium will, consequently, be increased. If, in addition, there is a definitely rounded border to the dulness on the left, we may be sure of some kind of a tumor of the mediastinum. Whether this is an aneurysm, enlarged glands, or a malignant growth, must be determined by other means, but the presence of even a small tumor in the mediastinum can easily be determined by careful percussion. Therefore, we can detect by this means a small aneurysm of the transverse arch as well as of the ascending arch.

Clinically we cannot usually distinguish a sacculated aneurysm from a diffuse aneurysm in this region, nor is the distinction of much practical value—at least in the earlier stages. In a majority of the cases, even when the aneurysm is sacculated, there is also a more or less general aneurysmal enlargement of the surrounding parts of the aortic wall. Moreover, the general dilatation is apt to involve both the ascending and transverse parts of the arch rather than to be confined to one part alone. This is especially likely to be true if there is enlargement of the area of dulness extending to the right and to the left of the sternum. If to the right alone, it suggests the ascending arch; if to the left alone, it probably involves the transverse arch.

If we are to detect cases of aneurysm of the aorta in an early stage, we should make the determination of the width of dulness over the great vessels a routine part of every chest examination, just as we now make the determination of the area of the heart or the examination of the apices of the lungs a matter of routine.

Having determined this area of dulness, we can get important confirmatory evidence of aneurysm by auscultation. A systolic murmur with greatest intensity directly over the dull area is very strong confirmatory evidence, but the absence of a murmur has little significance, and does not exclude aneurysm.

A more important thing to note by auscultation is the transmission of cardiac sounds. The vibrations which correspond to these sounds travel through the column of blood and the arterial wall more readily than they pass to outside structures. The result is that these vibrations reach the whole wall of the aneurysm with their intensity very little diminished. Therefore, over the area of dulness of an aneurysm we should hear the transmitted heart sounds louder than at parts of the chest outside of this area. This is what actually takes place. We are less likely to have this occur with glands or tumors, even if they lie against the aorta. Therefore, the greater audibility of the heart-sounds over an abnormal area of dulness in the region of the manubrium is very strong evidence that the tumor is an aneurysm.

Another change that may be noted by auscultation in some cases is an accentuated, low-pitched, ringing aortic second sound. Corresponding to this, a diastolic shock is sometimes felt by the hand resting either on the chest-wall or on the bell of the stethoscope. This diastolic shock and the peculiar aortic second sound constitute one of the most characteristic signs of aneurysm of the arch of the aorta. It is usually, however, found in the advanced stages and not in the early stages. However, I have seen it slightly marked in cases of arteriosclerosis with general dilatation of the aorta, even when the amount of dilatation did not cause symptoms and was not sufficient clearly to warrant a diagnosis of aneurysm. Therefore, when slightly marked, this sign may suggest an early stage of aneurysm. When well marked, it is one of the most characteristic signs of aneurysm, but then indicates that the aneurysm is no longer in its early stages. When present, it indicates that the first part of the ascending arch is involved in the dilatation.

Under the head of auscultation we may also consider those signs which may be heard without listening to the chest itself. These signs have to do with the voice and with the respiration. When the aneurysm presses on the recurrent laryngeal nerve certain manifestations may occur, due to imperfect action or to paralysis of the corresponding vocal cord. The effect of this upon the voice may vary from mere "weakness" of the voice, through hoarseness or huskiness, to aphonia. The cough may attract our attention by its peculiar barking or clanging quality. The breathing often has a peculiar quality, due to the wide glottic opening. Pressure on the trachea or bronchus may give a wheezing character to the breathing not unlike that heard in asthma. Usually this comes with inspiration, but it may be with expiration also. Sometimes it has a musical quality not unlike that of a ronchous rale. Any of these breathing sounds, connected with disturbance of the vocal cords, or due to pressure on the air-passages, may occur with an aneurysm that is too small to have reached the surface, and which might not attract attention from the front of the chest.

While considering auscultation as a means to early diagnosis, I have already referred to the possible aid from palpation in detection of the diastolic shock. This sign and the detection of a localized or general heaving pulsation at the level of the manubrium belong generally, however, to more advanced stages. I mention them because they are so often overlooked. In the early stages, however, palpation is useful in other ways. Its chief aid is in the detection of changes in the pulse and in determining the presence or absence of the tracheal tug. The changes in the pulse may consist either in a loss of strength or of a delay in the time of pulsation of one radial artery as compared with the other. Although this is rarely one of the earliest signs of aneurysm of the arch of the aorta, it frequently comes before there are external signs that are noticeable at the front of the chest. Therefore, the simultaneous examination of both radial pulses should constitute a part of our routine physical examination of patients. We should remember, however, that the difference in the two radial pulses may be due to irregular distribution of the arteries or to pressure somewhere along the course of one of the arteries, and that it is not necessarily due to changes at the arch of the aorta itself.

Another thing that should be noted as a matter of routine in the examination of every patient is the condition of the arterial walls. If we find arteriosclerosis of the radial arteries we should examine the region of the aorta very carefully for possible signs of aneurysm, for arteriosclerosis of the aorta underlies most cases of aneurysm. Particularly should this be done when arteriosclerosis is found in a middle-aged or young individual, for syphilis is thus suggested.

The tracheal tug is a much more valuable sign in early cases. If the trachea is put on the stretch by elevating the chin, a slight tug can be obtained when the aneurysm is still of quite small size. It is conceivable that a mediastinal tumor could give the same phenomenon by taking up space between a normal aorta and the trachea or the left bronchus, but, practically, I have met with little confusion from this source. It should be remembered, however, that retraction of the left lung may draw the left bronchus taut so as to produce the tracheal tug, when the chin is elevated and the trachea is put upon the stretch, even though the aorta is not enlarged. Therefore, it is of importance to examine the condition of the left lung before we give the tracheal tug its full significance in the diagnosis of aneurysm of the arch of the aorta.

Inspection is of little importance in detecting the earliest stages of aneurysm, but by careful inspection we may detect the signs of aneurysm at a much earlier stage than is often the case at present. A slight heaving of the chest wall above the cardiac area is one of the earlier signs. Next to this we are likely to find pulsation in an intercostal space, slight at first, and only to be seen by looking across the chest carefully. We must not forget, however, that visible pulsation to the right of the sternum may be due to displacement of the aorta by deformity of the spine, or to retraction of the lung, which leaves the aorta abnormally uncovered.

An interesting case in my service at the Boston City Hospital during the past winter shows the importance of the proper interpretation of signs seen on inspection in connection with the diagnosis of aneurysm of the aorta.

Case I.—At the time of the morning visit a man, who had entered the hospital on the previous afternoon, was found sitting up in bed with great distress in breathing, and with a marked cough. The breathing was of a distinctly asthmatic type, and it appeared at first sight to be an ordinary case of asthma. It was noted, however, that with each cough there was a protrusion in the second left intercostal space about over the location of the bronchus. This indicated some obstruction to the exit of air between that point and the trachea, and suggested the existence of bronchiectasis beneath the protrusion. In seeking a cause for the obstruction to the exit of air, pressure on the left bronchus was considered, and percussion and other signs at the manubrium showed the existence of an aneurysm of the transverse arch. Understanding the cause for his dyspnœa, an attempt was made to relieve it by lowering the blood pressure, which was decidedly high. Nitroglycerin was used and proved immediately effective, whereas quite large doses of morphine during the night had failed to give satisfactory relief. The diagnosis was later confirmed by *x*-ray examination.

Pulsation in the episternal notch is another sign that should be looked for on inspection in all cases. We sometimes find in old persons, with wasting of tissues and with slight enlargement of the aorta and great vessels, a pulsation at this place which should not be included under the head of aneurysm. But in other cases any pulsation in the episternal notch needs an explanation and suggests aneurysm. If the pulsation is at the bottom of the notch and its direction is upward, it is likely to indicate aneurysm of the arch. If, however, the pulsation comes from the one side or the other (and it is more common on the right side where the innominate artery lies), then there is enlargement of one of the great branches of the aorta rather than of the aorta itself. It may be noted in passing that palpation is useful in confirming the evidence of pulsation at the episternal notch which is obtained by inspection. By pressing the finger from the episternal notch down between the manubrium and the trachea, such an aneurysm may sometimes be palpated earlier than its pulsation can be detected by inspection. But such aneurysms should be detected at a still earlier stage by careful percussion. While this pulsation in the episternal notch ordinarily indicates an advanced stage of aneurysm of the aorta rather than an early stage, it has been surprising to me to see the number of cases in which the significance of this pulsation has been overlooked. Therefore, it is wise to include this sign when we are considering the detection of aneurysm at an earlier stage.

Of course, all cases of aneurysm of the innominate or of the common carotid artery do not mean that there is also an aneurysm of the arch of the aorta. But the association of the two is often overlooked. Usually there are not two separate aneurysms, but the visible aneurysm of the branch is the outlying part of a general aneurysmal dilatation which involves both the arch and its branches.

Among the physical signs associated with aneurysm the textbooks generally speak of inequality of the pupils. It seems to me that undue importance has been placed on this sign. When it exists, an aneurysm should be thought of as one of the possible explanations. However, I have seldom found it present except when the diagnosis was evident from other more definite signs; I have often found it absent when I should have expected it to be present; and I recall no case in which it was present in the very early stages. It should be recognized as interesting confirmatory evidence of aneurysm rather than as an essential part of the diagnosis.

Of much more importance in connection with inspection is the detection of evidence of obstruction to the venous circulation. This may involve the superior vena cava or its branches, or the azygos vein. The evidence may consist of localized œdema or of distended veins, or of both. It is suggestive only when confined to the areas of distribution of the above-mentioned veins—namely, the veins of the thorax, upper extremities, neck, and head. If the evidence is confined to a limited area, it furnishes a very definite means of locating the point at which pressure is exerted upon the venous trunks. This sign is of especial importance when the direction of growth of the aneurysm is backward and to the right, and pressure is exerted about the point where the azygos vein empties into the vena cava superior. A small aneurysm at this point may reveal itself more clearly by such evidence of pressure than by other physical signs. Except in this case, however, signs of obstruction to the venous circulation usually belong to advanced stages of aneurysm.

Before considering what symptoms are suggestive of aneurysm of the arch of the aorta, let me give a moment to the history as furnishing possible clues. The commonest predisposing cause is syphilis. Other etiological factors are alcohol, excessive or sudden strain, renal disease, lead poisoning, and gout. With the existence of any of these factors in the history, aneurysm should at least be included among the possible results. We should also remember that while arteriosclerosis is generally an antecedent condition of aneurysm, the most marked condition of arteriosclerosis may exist without giving rise to an aneurysm, and that aneurysms are more common in middle life than in later years—or when active physical exertion is combined with an existing arteriosclerosis. We should remember, on the other hand, that serious arteriosclerosis may exist in the aorta, and yet arteriosclerotic changes in the radial arteries may be extremely slight or may be absent. Therefore, we should not rule out the possibility of aortic aneurysm because we cannot detect arteriosclerosis of the radial arteries.

In considering symptoms in relation to the early diagnosis of aneurysm of the aorta, it should be noted that they are all due in one way or another to abnormal pressure which the aneurysm exerts upon surrounding structures. Their character will depend upon the part which is pressed upon and on the amount of pressure exerted. Symptoms from pressure will be of special importance in the early detection of aneurysm where important structures lie normally in close relation with the aorta, and so related that they cannot be readily pushed aside. Under these conditions *slight* enlargement will cause symptoms. This is the reason why symptoms play so important a part in the detection of an aneurysm of the transverse arch, whereas the ascending arch can push surrounding structures quite a distance before the pressure becomes important.

The deep-seated aneurysms of the descending arch or of the descending thoracic aorta should be mentioned in this connection. Pain (from pressure upon nerves) or difficulty in swallowing (from pressure on the œsophagus) may be the first suggestion of the existence of such an aneurysm. In either case, the aneurysm will usually have first attained considerable size, and we can hardly say that it is in an early stage. However, its deep situation prevents its detection by the ordinary methods of physical examination, and these symptoms are likely to be the earliest available clues. It is in cases of this sort that an x-ray examination may give definite information that can be obtained in no other way.

The pain from these deep-seated aneurysms usually comes from pressure backward upon the spinal nerves or their branches. It is usually confined to the distribution of one or two of these nerves, and often is on one side only. The pain constantly recurs at the same place. It may be dull or sharp. A characteristic sign is that it is increased by exertion, because that causes greater pressure by distending the sac. Such pains are often thought to be due to rheumatism or neuralgia. If they are persistent, remain definitely localized, and are increased by exertion, aneurysm should at least be considered. Pressure from other sources might cause the same symptoms. Difficulty in swallowing should at least suggest the possibility of an aneurysm as the cause.

Pain is usually present at some stage of development of aneurysms of the ascending and transverse arch. It is seldom, however, one of the earliest signs, although it may be the first that has attracted the patient's serious attention. It may be localized at the site of the aneurysm, or it may be referred to some of the spinal nerves, as in the case of pain from cardiac disease. It varies from a discomfort to a severe sharp pain. It may be anginoid in type. It is increased by exertion, it is persistent, and is likely to radiate from the mid-chest. Pain, with these characteristics, and without a cardiac condition sufficient to explain it, strongly suggests aneurysm.

Breathlessness, dyspnœa, and sometimes cough, are common symptoms, due to pressure on the trachea or a bronchus. As they are increased by exertion, it is a very common error to ascribe them to heart trouble. If accompanied by a history of periods of hoarseness or loss of voice, or even "weakness of voice," pressure on the recurrent laryngeal nerve is suggested and aneurysm should be thought of rather than heart trouble. This is even more so if the cough or the respiratory sounds are of the types characteristic of aneurysm. These symptoms of disturbance of breathing are characteristic of aneurysm of the transverse arch, and are often present when the aneurysm is so small as to be made out with difficulty by physical signs.

Of course, breathlessness or dyspnœa on exertion is characteristic of heart trouble as well as of aneurysm. In all such cases the heart should be examined. This is usually done, but too often the examination stops with the heart. Aneurysm should be looked for as well in these cases. Furthermore, aneurysm should be very strongly suspected if the cardiac condition does not give an adequate explanation of the dyspnœa on exertion.

It is not uncommon to have more or less serious heart disease and an aneurysm of the aorta in the same person. In such cases it is not always easy to determine which is responsible for the dyspnœa. In many of these cases the physician, finding a cardiac trouble that seems to account for the dyspnœa, goes no further. He overlooks the aneurysm and treats the case, as a case of broken compensation, with cardiac stimulants like digitalis. This increases the pressure and the distention of the aneurysmal sac, and, consequently, increases the dyspnœa. Then he omits digitalis, and tries nitroglycerin with splendid results, because it lessens the blood pressure. Then he tells of "another case in which digitalis did not agree with the heart, and nitroglycerin acted as a cardiac stimulant." These cases, as well as the high-pressure cardiorenal cases, are the ones that have led the thoughtless physician to look upon nitroglycerin as a cardiac stimulant rather than the vasodilator that it is.

Of course, we do have cases of cardiac disease in which digitalis does not agree, but in these cases it can usually be taken for some little time before this fact is manifest from the cardiac symptoms. If, however, digitalis clearly makes dyspnœa worse as soon as it begins to act, we should suspect the presence of an aneurysm of the aorta, for it offers the most rational explanation of this phenomenon. In 3 cases I have made the provisional diagnosis of aortic aneurysm pressing on the trachea or bronchus from exactly this history—to have it confirmed by physical signs when the examination of the chest was made.

Hemoptysis, caused by the oozing of blood from an aneurysm into the trachea, is not usually regarded as an early sign of aneurysm. Cases of a fatal hemorrhage of this sort from a relatively small aneurysm are reported, however, and I have recently seen an interesting case in which this was the first sign that drew attention to the aneurysm.

Case II.—A man, aged fifty-four years, had been treated by various physicians for heart disease for two or three years, during which he had complained especially of shortness of breath. He did have mitral stenosis and regurgitation. About one week before February 27, 1907, when he was seen by me in consultation, he began to spit blood. This was regarded as a symptom of passive congestion until he brought up thick, bright blood in considerable amounts. Physical examination showed, besides the cardiac disease, unmistakable signs of aneurysm of the ascending and transverse portions of the arch and of the innominate artery. Dulness over the great vessels extended 4 cm. to the right and 6 cm. to the left of median line. The omission of cardiac stimulants and the use of vasodilators, combined with rest in bed, brought prompt relief of the dyspnœa and a general cessation of the hemoptysis. He improved, and insisted upon going about. During the first three weeks in April he was about outdoors, sometimes walking over half a mile. Then he overexerted himself, and had a return of dyspnœa. On April 30 I saw him again in consultation. He was in extreme distress with orthopnœa, passive congestion of the lungs, liver, and kidneys, and marked œdema of the legs. This time the trouble was clearly from broken cardiac compensation, and not from the aneurysm. Digitalis was ordered in moderate doses, with an increase of nitroglycerin at frequent intervals, in the hope of preventing too great pressure in the aneurysm. Improvement followed.

Before closing the discussion of the diagnosis of these cases I wish to say a few words about the use of the *x*-rays as a help to diagnosis. It certainly is of the greatest aid in many cases. Some cases can be discovered by this means that could not otherwise be recognized, especially aneurysms of the descending arch and of the descending aorta. It usually gives more definite information about aneurysms of the ascending and transverse portions of the arch. When pulsation of the aneurysmal wall can be made out by fluoroscopic examination, it clears up the question whether the tumor is aneurysmal or of another character. When, however, no pulsation is visible, it should not be interpreted to exclude aneurysm.

On the other hand, the *x*-ray examination has disappointed me in sometimes failing to show an aneurysm of the innominate that was plainly evident by percussion. In one case the autopsy confirmed the diagnosis, and in a second case, palpation and inspection clearly showed there must be aneurysm of the innominate. In both cases the fluoroscope alone was used in *x*-ray examination, and apparently the slight increase of shadow due to the small aneurysm was not enough to be recognizable.

A small aneurysm of the transverse arch that gives a shadow little or no wider than that of the spine is extremely difficult to recognize by x-rays. In 3 cases a careful x-ray examination failed to show such an aneurysm, yet in each the existence of the aneurysm was later demonstrated by one means or another. In each of these cases I felt warranted in holding to the diagnosis of aneurysm in spite of the failure of x-rays to demonstrate it. I believe that in almost all cases a skilful physical examination and a careful consideration of the symptoms will enable the physician to diagnosticate aneurysm of the ascending or the transverse arch, even in the early stages, without the need of appeal to the x-rays. The x-rays are valuable in these cases, however, as confirmatory evidence, and sometimes in adding definition to the picture. Failure of an x-ray examination to reveal an aneurysm does not in all cases exclude its existence.

TREATMENT. It is not my intention to consider treatment in detail, but a few words should be said on the general principles of treatment as affected by the early discovery of these aneurysms. The regulation treatment of the books, involving rest in bed, diet, etc., is directed toward the treatment of the advanced cases that are described. Such treatment is not only unnecessary in the early stages, but it is positively harmful, because it interferes with the maintenance of general good health.

Our problem is essentially the reduction of pressure within the aneurysmal sac. We can do nothing to remove the tissue changes that have already occurred in the arterial wall, and have weakened it. Nature's methods of strengthening this weakened wall are to build up on the outside with connective tissue or to strengthen on the inside with organized blood clot. The latter method is most successful in the sacculated aneurysms with narrow openings from the artery. Relatively few of the aortic aneurysms come under this head, and inasmuch as most of the aortic aneurysms are essentially diffuse in type, very little can be hoped for from the formation of blood clot—especially in the earlier stages. The strengthening of the arterial wall and the development of connective tissue support will be more favorably carried on if we can prevent further stretching of the aneurysmal sac.

In order to prevent further stretching of the wall of the sac we must keep the blood pressure within certain bounds. To do this we must limit the force with which the heart drives the blood, and this is best accomplished by regulating the amount of exertion. In addition, we may have further to lessen the blood pressure by securing peripheral dilatation.

The regulation of the amount of exertion is a matter of judgment in the individual case. If there has been, from occupation or other cause, undue muscular strain, that must be prohibited. But rest in bed is unnecessary in the earlier stages. It has seemed to me that those cases in which I have tried rest in bed have lost by poorer nutrition fully as much as they gained by the avoidance of exertion. I cannot report cures accomplished by the moderate limitation of exertion—I do not believe a "cure" is possible in many of the cases—but by an intelligent limitation of exertion several patients have lived for years in comfort when otherwise their downward course would have been rapid. One patient lived eight years after the diagnosis was made, performing the ordinary duties of her household, and another patient lived four years, doing light housework and getting much enjoyment out of life by rather extensive travel.

It is essential that the patient should understand what the trouble is, its nature, and the mechanical principles that underlie treatment. Only in this way can we secure intelligent coöperation on his part, and, after all, the success of treatment depends more on his own regulation of his activities than on anything else. Every patient so far, upon learning the real problems of his case, has chosen, as I should do, to live a life of regulated activity rather than enforced rest. They have thus secured comfort and moderate enjoyment, even if they did not live quite as long. Undoubtedly both of the patients above mentioned at times did too much and put an unnecessary strain on the aneurysm, but I am sure neither could have endured greater restriction on the average without an amount of mental unrest that would have defeated the very object of the limitations. We must bear in mind that mental quietude is as important for a tranquil circulation as is limitation of muscular exertion.

Of drugs, the vasodilators are the most useful. The choice and dosage of these drugs are details hardly within the scope of this paper, but I wish to say a word about the iodide of potassium. This drug certainly has won for itself an established place in the treatment of aneurysm, but this has been largely on empirical grounds. It was assumed, but not proved, that this was due to vasodilator action. Some tried to test this by the ordinary blood pressure apparatus, and have argued from their failure that it does not lower the blood pressure.

The thought has occurred to me that certain cases of aneurysm of the transverse arch furnish fully as delicate a means of detecting an increase or diminution of blood pressure as is furnished by the apparatus ordinarily employed. In the yielding wall of such an aneurysm we have the weakest point of the arterial system—the one where change of pressure will be best shown by change in size. Some aneurysms press upon the trachea at just such a degree that a very slight increase of that pressure will produce dyspnœa or cough, while an equally slight lowering of the pressure gives relief. This condition has been clearly present at certain stages of some of the cases under my observation. Other drugs have given relief to these cases in a certain way, and it is accepted as vasodilator action. Is it not at least suggestive that iodide of potassium, though a bit slower, has relieved these cases in exactly the same way? Of course, I recognize the possibility that equally as great relief *might* come in some other way than by lowered blood pressure, but so far no one has been able to demonstrate what such a method is. I would claim that the conditions of an aneurysm as given above offer as delicate and accurate a means of performing a physiological experiment as does much of the laboratory apparatus. If it is objected that we assume certain conditions and do not see them, I can merely say that the careful, logical consideration of the facts may in some of these cases make the conditions equally as clear and certain as if seen with the eye.

When one can determine his facts well and can can think them out well, he can be sure of detecting aneurysm of the aorta in its earlier stages, and then he can do much to benefit his patient. Nothing more remarkable is needed.

SUMMARY. I may summarize the important points in connection with the physical examination as follows: Include in the routine physical examination the determination by percussion of the area of dulness of the great vessels; if one finds an abnormal area of dulness, determine carefully the conduction of the heart-sounds in this area; include in the routine physical examination the simultaneous examination of both radial pulses; examine for a tracheal tug in any suspicious case; be especially keen for any evidence by inspection or palpation; and, above all, keep aneurysm in mind and remember to examine carefully by all available methods if there is the slightest suggestion in the history or symptoms, or from any physical sign, that an aneurysm may exist. Thorough familiarity with the anatomical relations of the aorta to surrounding structures is of very great value.

I may summarize what has been said of symptoms by noting that, with the exception of the rare cases, in which there is trouble with swallowing, the early symptoms of aneurysm, manifested by pressure, are usually either pain or disturbance with the respiratory apparatus. The latter may come either from pressure on the air passages or from pressure on the recurrent laryngeal nerve. The symptoms frequently simulate those of heart disease, and their true meaning is learned partly by not finding a cardiac condition that will explain the symptoms, and partly by looking for and finding evidence of an aneurysm.

The picture of aortic aneurysm in its earlier stages is not uniform, but varies widely with the position and size of the aneurysm. There are no pathognomonic signs. The most characteristic feature of one case may be entirely lacking in the next one. And yet a careful physical examination and a careful consideration of the physical signs and symptoms should enable us to detect the existence of an aneurysm of the ascending or transverse arch at a very early stage. The *x*-ray examination is of use in the case of aneurysms in these two parts of the aorta as confirmatory evidence, as giving more definite information in some respects, and sometimes (when pulsation is seen) in deciding between an aneurysm and a solid tumor. The x-rays may detect aneurysms of the descending arch and the descending thoracic aorta which cannot be detected by the ordinary methods of physical examination. On the other hand, a negative report of an x-ray examination is not absolutely conclusive proof against the existence of an aneurysm.

The detection of an aneurysm of the arch of the aorta requires no greater skill than does the recognition of incipient tuberculosis. It is, therefore, within reach of the general practitioner, if he will give this disease equal consideration with tuberculosis. When discovered early, the treatment is not the same as in the advanced stages. Moderate limitation of exertion and mental quietude are essential, but absolute rest in bed is not necessary. While the disease cannot usually be cured, we can prolong life in comfort. The vasodilators are the most useful drugs so far as medication is demanded.

CARCINOMA OF THE MEDIASTINUM SIMULATING ANEURYSM.

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The following case is reported because of its great interest *per se,* because of the repeated thorough examinations by able men and the indecision or differences of opinion expressed by them, and the ultimate autopsy proof that no one had been able to make a complete diagnosis, the majority of the observers having been of the opinion that the disease was aneurysm of the aorta and no one seriously considering the presence of tuberculosis.

Charles O., aged thirty-three years, came to me February 13, 1905, with the following history: He had always worked hard in mining, beginning to earn his own living at eight years of age by working in the mines in England. At fourteen years of age he went to California and mined and prospected in the west and southwest. From 1895 to 1897 he was mining in South Africa. From 1897 to 1901 he mined in the Klondike, and since 1901 he had worked in the Klondike in summer, returning to the States in winter. He had had no previous illness, except that thirteen years ago he had what was diagnosticated as soft chancre. He was sure he never had any secondary lesions, as rash, sore throat, etc., but in spite of the diagnosis, under medical direction, he took a course of inunctions of mercury, and later a series of baths at Hot Springs, Arkansas. He stated that he had had some enlargement of the veins of his legs and body, beginning seven or eight years ago, but nothing to attract special attention until June, 1904, at which time, while on the steamer on his way to Alaska, he noticed that his neck was increasing in size, that he could not button his shirt about the throat and was obliged to get collars several sizes larger than usual, and that he felt drowsy most of the time. At Cape Nome he consulted a physician, who told him that he had strained his heart, and must refrain from all active exercise. His neck continued to swell until it measured twenty inches in circumference. He had previously worn a No. 15 collar. He returned to Rhode Island in October, 1904, and during the winter his condition remained unchanged. He had some cough, and at times raised blood-stained sputum. He stated that he had five hemorrhages one night, and was very sick after them. He called a physician who diagnosticated the case as pneumonia, and treated it as such. He was sick about two weeks, and some time later had a second attack of so-called pneumonia, and was confined to the house for about three weeks. Following these attacks he continued to raise blood-stained sputum in small amounts, and at times he raised small clots of dark blood. At about this time he began to have pain, shooting in character, in the right shoulder and down the right arm, and was much troubled by dyspnœa. At this time he came to see me. There was marked swelling of the neck and face, the ears and fingers were cyanotic, and the veins were very much dilated over the whole body. There was a large vein, the size of a lead pencil, on both sides extending from the pectoral region to the groin, the blood current in these veins being downward. The apex beat was slightly displaced to the left. A double murmur was heard at the aorta, the systolic murmur being most audible over the upper part of the sternum and to the right, the diastolic over the middle of the sternum and to the left. There was no measurable expansion of the right side of the chest. Breath sounds were absent over the right lung except on deep breathing, when they were faint. Vocal resonance and fremitus was less marked on the right side, and percussion resonance was but slightly altered. The heart sounds were transmitted quite distinctly to the right as far as the axilla. There were no tubercle bacilli in the sputum. At this time I considered the diagnosis to lie between aneurysm and some form of neoplasm, most probably syphilitic, and gave him iodide of potassium. Under this treatment his condition improved very much, the veins markedly diminished in size, the dyspnœa was much relieved, and the breath sounds became audible over the right lung.

In April, being still in doubt as to the diagnosis, I sent him to see Dr. F. C. Shattuck, who did not commit himself to an exact diagnosis, but was inclined to believe some neolpasm to be the cause of his symptoms. Blood examination was negative. An x-ray examination previous to this time showed the heart displaced downward and to the left, with a pulsating mass to the left of the sternum at the arch of the aorta, and the whole right lung somewhat darkened. In May another x-ray examination showed that the heart was not pressed down on the diaphragm so much as previously, and was drawn more to the right; the area of cardiac shadow extended more to the right; the whole right lung was more opaque; and the pulsating mass at the left of the spine remained the same. There was flatness and complete absence of breath sounds over the base of the right lung.

At this time he was again seen by Dr. Shattuck, who still considered it a neoplasm, with the possibility of an aneurysm with a laminated clot between the blood current and the chest wall. At this time, although many of the signs and symptoms were improved, his general condition was poorer than when I first saw him. In June he went to Chicago and at my request saw Dr. R. H. Babcock, and on the advice of friends there also consulted Dr. John B. Murphy. Both of these physicians considered aneurysm of the aorta to be present, and advised his undergoing treatment for this. He returned to Providence and entered the private ward of the Rhode Island Hospital, July 7, 1905, where I followed out the treatment suggested, because, if it were a new growth, no harm would be done, and if it were an aneurysm, he might be benefited. At this time examination differed from the preceding in that the right side of the chest showed some retraction and the left side some bulging, with a slight curvature of the spine toward the left. There were a few small glands palpable on the right side of the neck and one in the right axilla somewhat flattened and about the size of a nickel. The epitrochlear glands could not be palpated. The inguinal glands were palpable but not suggestive of any trouble. The area of cardiac dulness extended 6 cm. to the left of the sternum, 9 cm. to the right, and nearly to the sternal arch. Over the right upper lobe the breath sounds were faint but bronchial in quality. Over the right lower lobe they were absent. Tactile fremitus was absent at the right base and almost absent at the right apex. All sounds were increased over the left lung. There were no rales heard. The blood pressure was 121 mm. Hg. *X*-ray examination differed only in showing increased opacity of the right lung.

The patient was put to bed and kept absolutely quiet; he was given Tuffnell's diet, and a galvanic current was applied through the chest, large electrodes being used, to the point of toleration. Because of stomach symptoms, the diet had to be discontinued, but at no time after this was he able to eat much of anything, nausea being almost constant. Examinations of the sputum for tubercle bacilli were always negative. He failed rapidly, the only change on examination being a gradual extension upward of the dulness in the right chest. The temperature varied between 98.4° and 99° the pulse between 80 and 100, and the blood pressure was 120 mm.

On August 3 he was seen with me by Dr. Shattuck, who advised giving him greater liberties. The right lung became completely flat, though the breath sounds, bronchial in character, became audible over the lung (evidently transmitted). Emaciation and loss of strength progressed rapidly, and the enlarged gland in the right axilla gradually increased in size. On September 1 he began to have severe headaches, and a little later his mental condition became erratic. September 14, severe hiccoughing began, which lasted four days. On September 16 he began voiding urine involuntarily. Examination showed flatness over the right upper lobe, with considerable resonance over the right lower lobe, no breath sounds over the upper lobe, and large, moist rales over the front of the right lower lobe. September 18 the hiccoughing ceased, the patient felt much better, and enjoyed his meals, but had difficulty in breathing. Large, moist rales were heard over the front of the chest, marked over the right, less marked over the left. September 19 and 20 he felt fairly well until 8 P.M. in the evening of the 20th, when he began to raise a good deal of mucopurulent material having a very foul odor. Both lungs filled up with mucous rales and his finger-tips became blue. This continued until toward midnight, when he became rapidly worse and died at 2.45 A.M., September 21.

Autopsy. Just to the right of the median line under the clavicle and adherent to the first rib and the upper part of the cartilages of the first and second ribs, is a very hard mass, 6 x 5 cm. thick, firmly attached to the trachea and to the transverse portion of the arch of the aorta. Just below this is another very dense fibrous mass about 2 cm. in diameter, firmly adherent to the descending vena cava and to the right bronchus. The right lung is distended and solidified. In the upper lobe is a large cavity, filled with pus and broken down lung tissue, opening into the right bronchus. There are similar areas of softening in the right lower lobe. The bronchioles are filled with a creamy material. The lung is so adherent to the chest wall that it can be removed only by tearing. On the outer surface of the lower lobe is an area 2 x 3 cm. in diameter, where the pleura is nearly 1 cm. thick, yellowish in color, and quite firm. The kidneys and liver are dark colored and slightly congested, but otherwise normal. The left lung is normal. The head was not opened.

Microscopic Examination. Tissues were taken from the lung and mediastinal growth and examined by Dr. Frank T. Fulton, pathologist to the Rhode Island Hospital, who reported as follows: Sections from the mediastinal tumor were made up of dense, fibrous stroma, in which were scattered areas of epithelial cells. These areas of cells vary very much in their size and are entirely irregular. They, as a rule, are retracted from the surrounding connective tissue stroma. The cells forming the outer border of these groups of cells are arranged in a fairly definite irregular layer, but the other cells, the cells within, are very irregular in their arrangement, although fairly regular in size. The cells are rather large, and have a pale nucleus and a moderate amount of protoplasm. The nucleoli are fairly prominent. Mitotic figures are fairy abundant. The central part of most of these cell areas is completely necrotic, in some instances, however, the form of the cells is still preserved, but their ability to take the differential stains is lost. In other of the groups are seen areas closely resembling pearly bodies, that is, made up of cells which are slightly cornified. There are, however, no very pronounced pearly bodies. The whole appearance of the growth is such as to lead one to believe that it originated from epithelium of the epidermal form.

Sections from the lung show the outer surface to be covered by a thick layer of fibrin in which there are a few scattered groups of leukocytes. The lung itself in the part from which the selections are taken has lost its normal appearance. There are very few alveoli which even approach normal, and these are filled with mononuclear cells and leukocytes. In some places there is granulation tissue, in which are perfectly typical small tubercles showing the necrotic centre with the surrounding lymphoid, epithelioid, and giant cells.

Anatomical Diagnosis. Epidermoid carcinoma; pulmonary tuberculosis.

Thus we had, in this case, a sudden onset of symptoms in a man who had undergone exertion and privation of almost every sort, including work in the mines when a boy, packing over the Chilkoot Pass, starvation, and making money and losing it again; the chief symptoms were a remarkable dilatation of the veins of the whole body, but especially of the head and neck, a double murmur at the aortic orifice, slight displacement of the heart, a pulsating mass to the left of the spine at the arch of the aorta, the expectorating of a moderate amount of blood, and some pain radiating from the heart. These symptoms were certainly in harmony with aneurysm of the aorta. Against this was the lack of any bruit or expansile pulsation, and there was no laryngeal paralysis or tracheal tug. In addition to the absence of bruit and expansile pulsation was the relief given by iodide of potassium, the subsequent change in the position of the heart, and the appearance of enlarged glands in the axilla and above the clavicle. I could not at any time consider that an aneurysm accounted for these things.

For a number of weeks before death I believed the condition to be malignant disease, but I believed that the involvement of the right lung also was of cancerous nature. I was very much surprised when the lung was demonstrated to be tuberculous, especially considering the fact that until about forty-eight hours before death the patient's temperature was rarely above 99°, and at no time were tubercle bacilli present in the sputum.

Judging from the character of the tissues and the symptoms presented, the older of the growths pressed on the vena cava.

On section, this growth cut almost like pure fibrous tissue. Just when the tuberculosis of the lung started it is difficult to say, but it evidently had nothing to do with the symptoms or signs presenting themselves until the later part of his illness, though the firmness of the pleural adhesions indicated that they were of long standing and may have been of tuberculous origin, and a latent tuberculosis of the pleura may have developed into an active tuberculosis of the lung as a result of lessened vitality from non-aëration.

I believed that the signs at the base of the right lung were due to the pressure of some growth upon the right bronchus, and I still believe this to have been the case. That the blood expectorated was due to tuberculosis I do not believe, because no bacilli could be found in the sputum, because the signs were those of a collapsed rather than of a solidified lung, and because the *x*-rays showed a diffused cloudiness rather than a localized opacity, as one would expect if tuberculosis were sufficiently advanced to destroy the walls of the bloodvessels so as to cause a hemorrhage.

There was, thus, a carcinomatous growth occluding by pressure the superior vena cava, passive congestion and dilatation of the veins of the whole body, this dilatation being very marked over the upper half of the body, he rupture of some bloodvessel in the lung as a result of the passive congestion, pressure of the carcinomatous growth on the right bronchus, a secondary carcinomatous growth under the upper part of the sternum displacing the aorta to the left, involvement of the right axillary and cervical lymph nodes, infection with tubercle bacilli of the partially aërated lung, gradual extension of the tuberculosis, necrosis of practically the whole lung, and the breaking of this necrotic material into a bronchial tube causing death, the whole so closely simulating aneurysm of the arch of the aorta that but two of the physicians who saw the patient were willing to consider it anything except aneurysm.

CARDIAC ARRHYTHMIA DUE TO EXTRA-SYSTOLES ORIGINATING IN THE BUNDLE OF HIS.

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The following case illustrates a condition of which very few examples have been reported; in fact, its occurrence is only beginning to be recognized.

The patient, H. B., entered the Montreal General Hospital in December, 1906, complaining of shortness of breath of six months' duration and of cough for the preceding month. He gave a history of the free use of tobacco and of a severe strain in lifting a piece of machinery just before the onset of the symptoms. There was no history of rheumatism or syphilis. His condition on admission was as follows: A well-nourished man, aged forty-one years; skin and mucous membranes cyanotic; cough, with profuse mucopurulent expectoration. Cold extremities. Marked dyspnœa on exertion. Pulse small, easily compressible, and irregular (Fig. 1). Blood pressure, 98. Heart impulse weak. Area of cardiac dulness uniformly increased to a moderate extent. Sounds clear, but faint; no murmurs. A premature systole could be heard every second or third beat. There were evidences of pulmonary œdema at both bases. Under rest in bed, with administration of strychnine, the pulmonary œdema cleared up and the area of cardiac dulness diminished, but the rhythm of the heart did not show any material improvement. A number of tracings were taken with a small portable kymograph from the internal jugular vein and the brachial artery. Typical examples are shown in Fig. 2. A number of extra-systoles were recorded, but they all agreed in essential points with that represented in Fig. 2. The waves marked *A* in the jugular pulse are caused by the auricular systole. In that under which a cross is placed the ventricle is contracting at the same time, as shown by the unusual height of this wave and by the absence of the systolic wave and ventricular collapse from their ordinary positions. The brachial pulse corresponding to this heart-beat is not seen, being too weak to record itself.

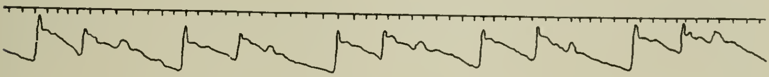

FIG. 1.—Radial pulse tracing. Time in $\frac{1}{5}$ seconds.

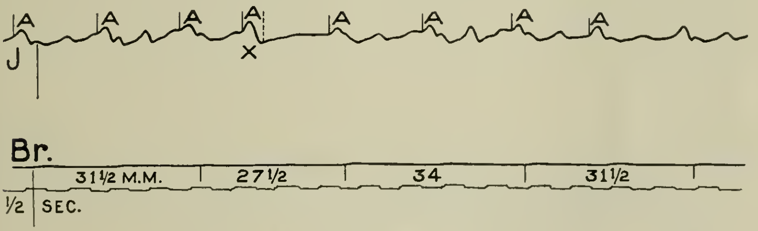

FIG. 2.—Tracing from the internal jugular vein and the brachial artery. Time in ½ seconds. Pulse intervals (bigeminal) are measured in millimeters. Time relations cannot be explained by ordinary ventricular extra-systoles. The high auricular wave at X cannot be explained by auricular extra-systoles.

The combined wave X occurs before either the ventricular or auricular systole is due. The auricular wave is not due, as estimated by the two preceding pulse intervals, until the point marked by the dotted vertical line. We, therefore, have the auricle and ventricle contracting simultaneously before either is due. We might explain their contracting together by a ventricular extra-systole, but this would not explain the premature contraction of the auricle. We can exclude ordinary ventricular extra-systole, moreover, from the fact that the first compensatory pause is very much too short. The two normal pulse intervals preceding the extra-systole together measure 31.5 mm. (in the original tracing the figure is reduced in size), the short and long interval separated by the extra-systole together measure only 27.5 mm., and the next two 34 mm. Compensation, then, is ultimately nearly perfect, but is spread over three pulse intervals, which excludes ordinary ventricular extra-systoles. We can explain the facts on the hypothesis that there is an extra stimulus acting on the auriculoventricular bundle of His. This travels down to the ventricle and up to the auricle, bringing about a simultaneous contraction of the two chambers. This hypothesis is the only one that seems to meet the case.

James Mackenzie[1] and K. F. Wenckebach[2] have drawn attention to the possibility of extra-systoles starting in the auriculoventricular bundle, and H. E. Hering[3] claims that it is a comparatively frequent occurrence. If this is the case, it is important that the means of recognizing it be more widely known, so that in time we may learn something of its etiology and of its bearing on diagnosis.

SOME OF THE REASONS WHY CHOLECYSTECTOMY SHOULD NOT BE PERFORMED AS FREQUENTLY AS IS ADVOCATED BY MANY SURGEONS.[1]

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Before speaking of cholecystectomy it may be well to recall briefly the physiology of the gall-bladder and the bearing that interference with its functions may have upon the subsequent condition of the patient. The functions of the gall-bladder are in brief these: It acts as a reservoir for bile, and as a tension bulb for the biliary passages through the medium of which the *vis a tergo* of the bile stream is equalized. The force of the current of the bile stream is best illustrated by what occurs after the removal of a normal gall-bladder, when, unless the cystic duct has been tied very securely and with a ligature that will not be absorbed too quickly, the *vis a tergo* of the bile current demonstrates itself by opening the stump of the cystic duct, with resulting escape of bile. I have had this happen in my earlier experience before I appreciated the importance of this knowledge of the force of the back-flow of the bile.

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[1] Observations on the Inception of the Rhythm of the Heart by the Ventricles, Brit. Med. Jour., 1904, i, 529–536.

[2] Archiv fur Physiolog., Leipz., 1905.

[3] XXIII Congress for Internal Medicine, Munich, 1906.

[1] Read at a meeting of the Southern Surgical and Gynecological Association, New Orleans, La., December 18, 1907.

While I am aware that patients who have had their gall-bladders removed may remain perfectly well, this does not demonstrate that the gall-bladder does not serve a useful purpose; the judicious surgeon—the surgeon who regards Nature and assists her as far as he can—will not ablate a gall-bladder which is still functionally active or which may later become functionally active. The fact that a diverticulum from the stump of the cystic duct or along the course of the common duct occasionally develops after the removal of the gall-bladder, is sufficient proof to me that the gall-bladder was placed where it is for a useful purpose. On the other hand, I have never seen this result follow ablation of a gall-bladder which had long ceased to functionate; evidently in such cases Nature has accommodated herself by slow degrees to the absence of a reservoir for the bile.

The gall-bladder is more active as a reservoir during the longest interval between eating, which is during the night; and it is for this reason that people with normally functionating gall-bladders sleep better, other things being equal, than do those who are not so fortunate. I have sometimes thought that, perhaps, the reason that persons with gall-bladder affections sleep better after a late supper than might be expected of persons in their condition, is that the process of digestion keeps the gall-bladder more or less empty of bile, and that thus the presence of the lesser evil procures less disturbed sleep.

From the standpoint of subsequent pathology the gall-bladder is surely a most useful organ by way of which to drain in certain septic conditions of the liver and biliary passages. It must be admitted that drainage is the essential feature in all truly infectious diseases of the biliary passages; and as the use of the gall-bladder for this purpose, whenever possible, is safer for the ordinary surgeon than either of the deeper and more dangerous operations, namely, drainage of the common duct or of the hepaticus, the gall-bladder should be preserved whenever possible.

When chronic pancreatitis occurs after removal of the gall-bladder, prolonged drainage is indicated; and since, even if the common duct be obstructed, it is very exceptional to meet with such a degree of dilatation as will permit of a choledocho-enterostomy, the surgeon is hard put to it to maintain drainage for a sufficiently long time. If, however, the gall-bladder has not been removed, a cholecystoenterostomy will solve the problem by giving not only a shorter convalescence, but a more certain recovery due to the permanent drainage.

In the absence of the gall-bladder, and in the presence of an hepatic emergency, the surgeon will be obliged to drain the common duct or the hepatic duct itself. Each of these procedures is an operation which may tax the skill of the expert abdominal surgeon; and if so, What must they be for surgeons of limited experience in this line of work? The gall-bladder and cystic duct, anatomically, hold the same relations to the common duct that the cecum and its anterior longitudinal, muscular band do to the appendix; therefore the presence of the gall-bladder and the cystic duct is the white-signal light to the surgeon who has to expose and drain the common duct in the absence of a foreign body—which latter will serve to locate the duct. For the above reasons, as well as those I shall presently mention, we should feel keenly our responsibility when reaching a decision to do a cholecystectomy or a cholecystostomy.

When a gall-bladder is removed in the presence of infection of the bile passages, drainage should be established; when it is possible the stump of the cysticus should be drained; and if this cannot be done drainage of the hepaticus by means of the choledochus should be done, in all cases a rubber tube being introduced.

Some surgeons assert that after cholecystectomy sufficient drainage takes place by means of the choledochus into the duodenum, but it is much wiser to drain outside of the abdomen than to allow the infectious bile to flow into the duodenum, from which, as well as from the bowel further along, the toxic elements in the bile may be taken up by the tributaries of the portal vein, and the hepatic cells thus be exposed to the risk of re-infection. To me it is incomprehensible that surgeons should regard drainage of the hepatic duct through the common duct into the duodenum as sufficient in cases of cholangitis. To drain one infected organ into another—the duodenum—I consider unsurgical in the extreme. In cases of severe pyelonephritis we are not satisfied with the drainage afforded through the ureter into a bladder which was probably the original seat of the disease; we perform nephrotomy and drain the kidney directly into the loin. So when the liver is infected and there is suppurative cholangitis, the only chance of safety lies in direct hepatic drainage through the laparotomy wound.

When in doubt I say drain rather than remove a gall-bladder which may recover itself; better do this even at the expense of a fistula (mucous) which will call for a second operation, than take out a gall-bladder which may again normally functionate. Better, I say, do two operations in the attempt to save a gall-bladder that may recover itself, and in not a few of these instances save a human life at the same time, than do an operation which will certainly sacrifice the one if not both.

That the mortality from drainage of the gall-bladder is less than that which attends its removal, we know. We must consider, moreover, the remote as well as the immediate mortality following cholecystectomy: this includes peritonitis from spreading infection, from hemorrhage which kills within two or three days, and the small bleeding responsible for a still later peritonitis—to say nothing of the additional shock to the patient by the latter operation, which entails more time and longer intraperitoneal manipulation; and these are very serious matters in many gall-bladder cases. This prolongation of the operation too often throws an additional burden upon already toxic kidneys as well as upon other emunctories which they can ill afford. I have no hesitancy in proclaiming my partiality for the simpler of the two operations; notwithstanding the fact that my views are at variance with those of many operators, my individual experience has taught me the wisdom of taking this stand.

That the question of postoperative adhesions is a matter of more moment after cholecystectomy, I know from repeated experiences in operating for the relief of symptoms thus caused. It is only necessary to recall the anatomical relations of the viscera in the immediate neighborhood of the under surface of the liver, and our utter inability, in many instances, thoroughly to cover all of the exposed surfaces following the ablation of the gall-bladder, to arrive at a just appreciation of the crippling power of postoperative adhesions in this region.

Bland-Sutton in a recent article on the "Indications for the Performance of Cholecystectomy," makes the assertion that "Observations in the dead house show that disease destroys it (the gall-bladder) very often without even causing inconvenience to the individual." This is a rather brave assertion, particularly when the dead cannot speak.

The occurrence of biliary colic is very rare after the removal of stones and drainage. What is not very uncommon, is colic the result of adhesions; this, if it occurs, calls for opening of the abdomen and release of the adhesions. The recurrence of stone as an objection to cholecystostomy may practically be dismissed. The chief objection to cholecystostomy is the occurrence of fistula; with our present methods, however, this is much less frequent than formerly when we attached the gall-bladder to the abdominal wall.

Fistulæ are of two kinds: mucous and biliary; the former is the result of obstruction of the cystic duct; in the latter the cystic duct is patulous as a matter of course, otherwise we should not have a free flow of bile. The former I admit will require, in practically all instances, cholecystectomy; the latter not. I have been able to close most of these biliary fistulæ by freeing the fundus of the gall-bladder at the point of attachment, and turning in the margins of the opening and suturing; occasionally I have found it necessary to drain the gall-bladder (without attaching it anew to the abdominal wall); and in a few instances I have made a cholecystoduodenostomy. Rarely, if ever, has it been necessary to do a cholecystectomy. The gall-bladder should not be removed unless we feel that by so doing we are taking away a menace to the future health and comfort of our patient.

Silk should never be used in the gall-bladder for repair or for the retention of a drainage tube; even chromicized catgut ligatures may act in the same way as silk, forming a subsequent nidus for gallstones.

In hydrops of the gall-bladder cholecystectomy is practically always required, since obliteration of the cystic duct renders the gall-bladder not only useless, but a continued menace from the liability to re-infection and even rupture. The only exception I would make to this rule is in obstruction of the cystic duct by stone if of recent standing; if the gall-bladder shows but little macroscopic evidence of disease, and upon dislodgement of the stone bile flows immediately into the gall-bladder, it may be wise to leave the gall-bladder.

Cholecystectomy should be done in cancer or other new-growths of the gall-bladder when they are limited to the gall-bladder; and in calcareous degeneration or in fibrosis of the gall-bladder.

Traumatism of the abdominal wall with rupture of the gall-bladder has occurred twice in my experience; in neither case was it necessary to do more than drain.

Chronic empyema calls for cholecystectomy, while in acute empyema drainage, may suffice. Gangrene of the gall-bladder naturally requires its excision, and the same is true of perforation, since this last condition occurs most frequently when the gall-bladder wall is extensively diseased. In the presence of gangrene of the gall-bladder when there are severe constitutional symptoms, it may be wise to leave the gall-bladder temporarily; this has been done, and removal accomplished at a subsequent period, with good results. I have seen many acute empyemas recover after drainage only.

When the fundus of the gall-bladder only is diseased it should be resected, and the remaining part of the gall-bladder drained.

Ablation of a gall-bladder, the seat of stones, but otherwise healthy, is indicated when many small stones, all of which cannot be removed, are embedded in the mucous membrane. It will readily be understood that if even a single stone remains behind, we take chances on subsequent stone formation.

The only way of determining a patulous cystic duct, before opening the gall-bladder, is by palpating the duct for induration of its coats or wall (after division of the peritoneal covering), to see if it is kinked or pouched, and compressing of the gall-bladder, which, if the duct is open, should rapidly empty: the latter method is by far the more reliable. The gall-bladder should not be removed unless the cystic duct is permanently and irremediably occluded, and the walls seriously diseased. With few exceptions, when the duct is patulous, the gall-bladder should not be removed in acute catarrhal calculous or non-calculous cholecystitis; nor even always in acute suppurative calculous or non-calculous cholecystitis. In but comparatively few cases of chronic calculous or non-calculous cholecystitis is ablation indicated, unless hydrops, fibrosis, or calcification of the wall of the organ exists. I do not believe that the removal of the gall-bladder prevents absolutely the recurrence of stone, for we know that stones, though rarely, are found in the smaller hepatic ducts and in the common duct.

In gall-bladder work, as well as in other departments of surgery, hard and fast rules cannot always be followed. Whether the gall-bladder shall be taken out or not must sometimes be decided not only by the condition of the organ itself, but also by the condition of the patient. While cholecystectomy may be proper when the gall-bladder alone is involved, it may not be proper in the presence of associated disease of the bile ducts.

This question of cholecystectomy, pro and con, appeals to me strongly. From what I read and hear, I fear that removal of the gall-bladder is done too frequently; and I feel that the influence of the prevalent teaching in favor of cholecystectomy upon those who have not had sufficiently large experience to decide for themselves for or against removal, will be bad indeed. Personally I can honestly say that the more gall-bladder surgery I do, the less inclined I am to remove the gall-bladder.

PERFORATION OF THE GALL-BLADDER DURING TYPHOID FEVER; CHOLECYSTECTOMY; RECOVERY.[1]

WITH AN ANALYSIS OF TWENTY-ONE OPERATIONS ON THE GALL-BLADDER DURING TYPHOID FEVER.

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Although inflammation of the gall-bladder is frequently observed in typhoid fever, and though numerous cases of post-typhoid cholecystitis have been reported, yet operations for perforation of the gall-bladder during the course of the disease are sufficiently rare to make them worthy of record. For the privilege of reporting two cases, and of operating on the second patient, I am indebted to Dr. G. G. Davis, in whose service at the Episcopal Hospital they occurred.

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[1] Read at a meeting of the College of Physicians of Philadelphia, November 6, 1907.

Case I.—*Perforation of the gall-bladder on the thirty-second day of typhoid fever; exploratory laparotomy; death in twenty hours.*

Clarence S., aged twelve years, was admitted January 26, 1907, to the medical wards of the Episcopal Hospital, under the care of Dr. A. A. Stevens. He had been ailing for about three weeks, but had been confined to his bed at home for the last week only, complaining of pain in the abdomen, nausea, vomiting, headache, and diarrhœa. There had been no epistaxis. On admission he presented a typical picture of a severe case of typhoid fever in the fourth week: face flushed, pupils dilated, tongue coated and dry, lips dry. Slight bronchitis. Heart normal. Abdomen soft; spleen enlarged and palpable; rose spots present. The Widal test was positive, and the leukocytes numbered 10,800. His temperature was 101.8° F.; pulse, 104; respirations, 24.

January 28. Quite delirious; moaning all the time in his sleep.

February 3. Still has mild delirium. Temperature has varied little, ranging from just below 103° F. to over 104° F. His pulse rate has varied from 120 to 130; and his respirations have been about 24 per minute.

5th. (Thirty-second day of disease). At 10 A.M. was found to be in pain; had not complained of sudden onset of pain. He now has pain in right side of abdomen. Temperature, 104.4° F.; pulse, 132; respirations, 24. Leukocytes, 10,200. There is some rigidity of the right rectus muscle; the most tender spot is over the belly of right rectus, on level of umbilicus. No appreciable tenderness on left side. No distention.

11 A.M. Pain, tenderness, and rigidity considerably increased. The abdomen moves very little with respiration. The leukocyte count has fallen from 10,200 at 10 A.M., to 6600 at 11 A.M. 1 P.M. Pain, tenderness, and rigidity still more increased; also more distention. Tenderness is no longer so sharply localized, but has spread over entire abdomen; yet the most tender area is still on right side. 2 P.M. Temperature, 102.4° F.; pulse, 120; respirations, 36. Leukocytes, 6200. A study of the temperature chart shows that there had been a steady rise of temperature, beginning the morning of February 3 (forty-eight hours ago), from 101.8° to 104.4° F., and that on the occurrence of perforation this morning there was a fall of two degrees (to 102.4° F.) within three or four hours. There has been practically no change in the pulse rate. The leukocyte count fell within four hours from 10,200 to 6200. A diagnosis of probable intestinal perforation was made. 3 P.M. Laparotomy (ether) by Dr. G. G. Davis, five hours after the occurrence of perforation. A transverse incision was made in the right iliac region, at the level of the anterior superior iliac spine, splitting the anterior and posterior sheaths of the rectus and the transverse abdominal muscles. Considerable bile-stained fluid was found on the gauze sponges inserted among the intestines. The entire small

intestine and about six inches of the ascending colon were explored, but no perforation was found. All the intestines were markedly injected and inflamed. On account of the patient's critical condition, no further attempt was made to find the lesion causing the peritonitis. A rubber tube and iodoform gauze drain were introduced and the wound partially closed.

6th. The patient died at 11 A.M., twenty hours after operation. Chemical examination of the fluid removed at operation showed the usual reactions for bile. Postmortem examination through the wound of operation showed general peritonitis, with a perforation of the gall-bladder.

CASE II.—*Perforation of the gall-bladder on the forty-second day of typhoid fever; cholecystectomy; recovery.*

John S., aged twenty years, was admitted February 15, 1907, to the medical wards of the Episcopal Hospital, under the care of Dr. A. A. Stevens. His chief complaint was diarrhœa and weakness. His family history was negative, and he had never been ill before. His present illness began two weeks before admission, with headache, malaise, anorexia, cough, diarrhœa, and general weakness. There had been no epistaxis. He had not been in bed constantly before admission.

On admission his temperature was 104° F.; pulse, 120; respirations, 24. His face was flushed, his pupils normal, his tongue coated and moist, and his throat clear. His lungs were clear, and his heart was normal. The abdomen showed slight distention and tenseness; no rigidity; no gurgling; some general tenderness. Spleen very slightly enlarged to percussion. There were a few typical rose spots on the abdomen. The Widal test was positive, and the leukocytes numbered 8000.

His temperature pursued a rather irregular course, falling considerably after each bath, then rising again, but showing a gradual tendency to subside. It became normal about the thirty-seventh day of the disease, but again began to rise irregularly on the thirty-ninth and fortieth days. For a week he had not been tubbed. His bowels had been constipated, but were opened occasionally by enemas. His pulse varied from 68 to 80.

March 14. (Forty-first day of disease.) His temperature shot up to 103.2° F. at 4 A.M., and he was tubbed. At 8 A.M. his temperature was 104° F., pulse, 120; and he was again tubbed. He now vomited some greenish fluid. At 10 A.M. he complained of not feeling so well as on previous mornings. He complained of no pain anywhere. On deep palpation below the right costal border there was slight though distinct tenderness. No mass palpable. Apparently no distinct rigidity. His general condition was good. The leukocytes numbered 24,400. At noon, temperature, 104.8° F. No bath. Ordered calomel, grain $\frac{1}{4}$, hourly for six doses, to be followed by half an ounce of Epsom salt. At 4 P.M., temperature, 104.2° F.

No bath. At 8 P.M., temperature, 103.6 F. No bath. At 11.30 P.M. it is noted that both local and general conditions had remained about the same during day. Patient had vomited all medicines during the day. Probably the tenderness below the right costal border was slightly increased. Temperature, 104.4° F.; pulse, 116: respirations, 28.

15*th*. (Forty-second day of disease.) 4 A.M., temperature, 100.2° F.; pulse, 136; respirations, 28. Pain and tenderness are now severe in right upper abdominal quadrant. He has vomited some more green fluid. The skin is somewhat leaky. The pulse is rapid, but of good volume. Entire right half of abdomen is very rigid, but practically all pain and tenderness are above the level of umbilicus. There is no distention, nor is there dulness in the flanks.

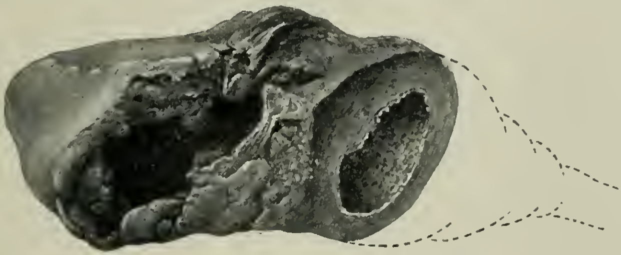
A diagnosis of perforation of the gall-bladder was made by the resident physician, Dr. von Buddenbrock, and I was sent for.

When I first saw the patient he looked like a man of forty years. It was surprising to be told he was only twenty years of age. His expression was characteristic—not the Hippocratic facies, but rather a general weakening of all the features, a change which has been particularly alluded to by Dr. Harte.

With the history of a rapid rise of the temperature from nearly normal almost to 105° F., followed by abdominal pain, tenderness, and rigidity, the existence of intra-abdominal mischief was sufficiently evident. The localization of the symptoms to the right upper abdominal quadrant, and the memory of the perforated gall-bladder observed only a few weeks previously, strongly suggested that the gall-bladder was the seat of trouble in this patient. Following this train of symptoms, which had rapidly developed within the last twenty-four hours, came the sudden drop of more than four degrees in the temperature within three hours, with the coincident quickening of the pulse from 110 to 136 and the occurrence of sweating. With such a history and train of symptoms, the diagnosis of perforation of the gall-bladder seemed justified.

At 8 A.M., four hours after the occurrence of perforation, I operated on the patient under ether anesthesia. A small exploratory incision was made through the outer border of the right rectus muscle, splitting its fibers, above the level of the umbilicus. There was a little free serum, but there were no adhesions to the parietal peritoneum. As the transverse colon was seen to be adherent above to the liver, the incision was extended upward, its total length being four inches. The upper abdominal region was then carefully isolated by gauze packs, and the adhesions, which were light and evidently of quite recent formation, were cautiously ruptured. There at once welled up from above the transverse colon some more serous fluid, which was quickly followed by four or five ounces of thick, inodorous, milky pus. This pus, which seemed to come from the under surface of the liver, was rapidly sponged away. (A culture made during the operation gave a pure growth of typhoid bacilli.)[2] The pylorus and duodenum were then recognized, as well as the round ligament of the liver. Then the gall-bladder was found, further to the patient's right, buried in rather dense adhesions between the liver and the colon. There was a large and ragged perforation, measuring 1¼ x 1½ inches, in its lower and inner wall, not involving either fundus or neck, and accounting by its size for the collapsed condition of the gall-bladder. The gall-bladder was enucleated; its neck was ligated with chromic catgut, and it was cut away (see figure). A rubber tube and two gauze packs were inserted as drains; the isolating packs were removed, and the abdominal incision partly closed with through and through silkworm-gut sutures.

The operation lasted twenty-three minutes, and the patient was in a very precarious condition at its conclusion. A wet dressing of alcohol and salt solution was applied over the whole abdomen, and in the manner of a poultice was covered with waxed paper and absorbent cotton. Throughout the operation the patient had been surrounded by hot-water bottles, and every effort was made to prevent chilling him.



Gall-bladder removed by cholecystectomy, showing typhoid perforation. (Natural size.)

The patient was given one-thirtieth grain of strychnine sulphate and ten minims of the tincture of digitalis, every fourth hour, hypodermically. He also received six ounces of hot saline solution, with four ounces of peptonized milk, every fourth hour by enema. He was given one hypodermic injection of one-eighth grain of morphine sulphate.

16*th*. There was some bilious vomiting, but this was arrested by washing out the stomach. His head was clear, and he felt well except for tenderness over the wound.

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[2] My thanks are due to Dr. D. L. Despard, assistant pathologist to the Episcopal Hospital for his very painstaking and persistent search for micro-organisms in sectons cut from the margins of the perforation in the gall bladder. In spite of the use of varied stains and the examination of numerous sections, he was unable to demonstrate the presence of the typhoid bacillus in the tissues.

17th. The dressings were bile-stained (the third day); fluids were given by mouth; also one-half ounce of whisky every sixth hour.

20th. Five days after the operation the patient was lying on his right side, and considered himself convalescent. Gastric lavage was again employed for bilious vomiting. The drainage tube was removed, and the gauze on the gastric side was loosened.

21st. Six days after the operation the temperature reached normal. "The patient lies on right or left side. There has been no more vomiting."

With the exception of one rise of temperature to 101° F., recovery was uneventful. The last gauze was withdrawn, and feeding on soft diet was begun, on the ninth day after operation No pus discharged from the wound after the first week, and the discharge of bile gradually lessened. In the fourth week after operation the temperature rose for a couple of days to 103° F., owing to the development of an acute otitis media; and in the fifth week a furuncle on the leg caused a rise to 103° F.; but finally convalescence was assured. The sinus ceased to discharge in the fifth week, and the patient was sent home, well, May 15, 1907, just two months after the operation.

The successful result in this case may be attributed to several factors. Among causes which may be said to have predisposed to his recovery are: (1) The stage of the disease at which perforation occurred, when the height of the fever was past; (2) the existence of a pure typhoid infection, uncontaminated by the more deadly colon bacillus or by the streptococcus; (3) the youth of the patient —only twenty years—and his good constitution; and (4) the short period—four hours—that elapsed between perforation and operation. The excellent tissue reaction shown by the patient, evidenced by the leukocytosis of 24,400, and by the promptitude with which protective adhesions were formed, must also be considered. As exciting causes should perhaps be mentioned the fact that the gall-bladder was excised, and that such care was taken to prevent diffusion of the infection below the transverse colon. Two months in the hospital after either a cholecystectomy or an attack of typhoid fever would be an abnormally long sojourn, but when both occur simultaneously in the same patient, the rate at which strength is regained is exceptionally slow.

This patient was seen again in October, 1907. He was in excellent health, had been at his work as a paper-cutter all summer, and felt no inconvenience from the operation. The scar had contracted to a length of less than three inches; it was firm and unyielding, and there was no impulse on coughing.

In connection with these 2 cases from the Episcopal Hospital, I have analyzed the reports of 19 other operations done during the course of typhoid fever for lesions of the gall-bladder. A number of operations done after complete recovery from the disease, for post-typhoid affections of the gall-bladder, have not been included. Such operations have been recorded by Gibbon,[3] Harte,[4] Halsted,[5] Deaver,[6] Martin, Frazier[7] and other surgeons. A case reported by Dr. H. B. Allyn,[8] in which operation was done by Da Costa for perforation of the colon into an adherent gall-bladder, was included in the tables I published some years since, in collaboration with Dr. Harte;[9] it is not included in the present table because it was thought by Dr. Allyn that the perforation originated in the colon, not in the gall-bladder.

Taking, then, only those 21 operations done before the patients recovered from typhoid fever, we have a record of 8 recoveries and 13 deaths, or a mortality rate of 61.9 per cent. In 4 cases, all fatal, the operation was abandoned before the gall-bladder lesion was found. Should it seem proper to anyone to exclude these cases, it would leave a total of 17 completed operations, with 8 recoveries and 9 deaths, or a mortality rate of less than 53 per cent. Compared with operations for intestinal perforations during typhoid fever, which give an average mortality, in collected cases, of from 75 to 80 per cent., operations on the gall-bladder during typhoid fever may seem almost benign; but their real gravity is apparent when they are compared with similar operations on patients without constitutional disease. In these the mortality varies from 3 to 10 per cent.

The operations employed in the present series of cases may be seen in the following table:

Operation.	Cases.	Recovered.	Died.	Mortality. Per cent.
Aspiration of gall-bladder through unopened abdominal wall	1	1	0	.....
Cholecystendysis	2	1	1	50.00
Cholecystotomy and drainage	9	4	5	55.55
Cholelithotomy	2	0	2	100.00
Cholecystectomy	3	2	1	33.33
Operation abandoned without finding lesion	4	0	4	100.00
Total	21	8	13	61.90

The number of cases involved is, of course, too small for any definite conclusions to be drawn from a statistical study; but it may be said, in brief, that this complication seems to be most frequent in females between twenty and forty years of age, and during the second or third week of the disease.

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[3] Annals of Surgery, 1901, xxxiii, 70.

[4] Ibid., 71.

[5] Trans. Assoc. Amer. Phys., 1897, xii, 390, Case 2.

[6] A. O. J. Kelly. AMER. JOUR. MED. SCI., 1906, cxxxii, 459, Case 7.

[7] B. A. Thomas. New York Med. Jour., 1907, ii, 688.

[8] Phila. Med. Jour., 1901, ii, 193.

[9] Annals of Surgery, 1904, i, 7.

The lesions found may be seen in the annexed table:

Lesion.	Cases.	Recovered.	Died.	Mortality. Per cent.
Cholecystitis alone	4	2	2	50.00
Cholecystitis and empyema of gall-bladder	3	0	3	100.00
Cholecystitis, empyema, and peritonitis	4	2	2	50.00
Perforation with peritonitis	6	4	2	33.30
Perforation (found only at autopsy)	4	0	4	100.00
Total	21	8	13	61.90

The bacteria found were as follows:

Bacterium.	Cases.	Recovered.	Died.	Mortality. Per cent.
Typhoid bacillus (pure culture)	9	5	4	44.40
Typhoid bacillus and colon bacillus	1	0	1	100.00
Paracolon bacillus	1	0	1	100.00
Not recorded	10	3	7	......

In two of the patients treated by cholecystectomy two small calculi were found in each gall-bladder. In the case of the patients tabulated as having been treated by cholelithotomy there were 152 and 150 gallstones, respectively. Thus, in only 4 cases (19 per cent. of the total number) were stones found in the gall-bladder. Among the 216 cases of infection of the biliary tract studied by Kelly,[10] 84.2 per cent. had calculi; this would make it appear that calculi do not particularly predispose to gall-bladder complications during typhoid fever. That the typhoid bacillus, however, is a rather frequent factor in the causation of subsequent inflammatory affections of the gall-bladder is proved by Dr. Kelly's[11] earlier investigations, which showed that this organism was present in 10 per cent. of the cases studied bacteriologically.

The symptoms are recorded in all but 2 patients. There are two quite distinct classes of cases: In the first there has been a more or less gradual onset of abdominal pain, fairly well localized (by patients who were conscious) to the right hypochondrium, accompanied by localized tenderness, and frequently by a palpable mass, easily recognized as the distended gall-bladder. If operation has been undertaken at this stage, there has been found (*a*) cholecystitis; (*b*) empyema; or (*c*) empyema and commencing suppurative pericholecystitis. In the second class of cases the symptoms already mentioned have existed for a period varying from a few hours to a week or ten days, when suddenly there has been an acute attack of abdominal pain, accompanied by a fall of temperature (noted in 8 out of 10 cases), and sometimes by sweating; these signs being gradually followed, when immediate operation was not undertaken, by a secondary rise of temperature, a spread of the pain and tenderness over the whole abdomen, and an increasing distention of the intestines. In one patient (Alexieff) a gall-bladder, which had been palpable for some days, suddenly collapsed and could no longer be detected on the occurrence of perforation. In a few cases, as in the first patient now reported (Davis), the delirious or semicomatose condition obscured the symptoms usually preceding perforation, and the only physical signs detected resembled so closely those of intestinal perforation that the diagnosis naturally inclined to this much more frequent complication.

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[10] Amer. Jour. Med. Sci., 1906, cxxxii, 755

[11] Ibid., 447

It is interesting to note that out of the 21 cases reported, a correct diagnosis was made in 11; in 9 cases the diagnosis made was intestinal perforation; in 1 case (a woman eight months pregnant) the only diagnosis was peritonitis.

As to the frequency with which the gall-bladder is involved in typhoid fever, no satisfactory statistics have been published. At the Episcopal Hospital the reports do not mention the complication of cholecystitis prior to the year 1905. From January 1, 1905, to October 1, 1907, there have been treated in our wards 2864 patients with typhoid fever. Among this number there were 243 deaths (a mortality of 8.48 per cent.). There are recorded 18 cases complicated by cholecystitis (about 0.62 per cent. of the whole number of cases); and among the cases thus complicated by cholecystitis there were 4 deaths. This, however, by no means implies that the deaths were due to the cholecystitis, since patients who at one stage presented symptoms of cholecystitis might recover from those symptoms and die at a later period from the toxemia of typhoid or from asthenia; yet they would still be reported as cases complicated by cholecystitis. Only two of these cases were considered serious enough for the thought of operation to be entertained; and it appears a mere coincidence that these two should both have been observed during the present year, within a few weeks of each other.

Cases of Typhoid Fever at the Episcopal Hospital, Philadelphia.

Year.	Cases.	Deaths.	Mortality. Per Cent.	With gall-bladder complications. Cases.	Deaths.
1905	981	85	8.66	8	1[12]
1906	1339	107	7.99	6	2[13]
1907 (to Oct. 1)	544	51	9.37	4	1[14]
Total	2864	243	8.48	18	4

[12] Recovered from cholecystitis before death. No operation.

[13] Neither patient was operated on. Autopsy only in the second case; this showed no peritonitis, and that death was due to pneumonia.

[14] Operation by Dr. G. G. Davis. Perforation of gall-bladder found postmortem.

Twenty-one Operations on the Gall-bladder during Typhoid Fever.

Sex.	Recovered.	Died.	Total.	Mortality. Per cent.
Male	3	8	11	72.7
Female	5	5	10	50

Age.	Recovered.	Died.	Total.	Mortality. Per cent.
Less than 10 years	1	0	1	00.0
10–19 years	1	4	5	80.0
20–29 years	2	3	5	60.0
30–39 years	2	4	6	66.6
40–46 years	2	2	4	50.0

Stage of disease.	Recovered.	Died.	Total.	Mortality. Per cent.
Fiirst week	0	1	1	100.0
Second week	0	3	3	100.0
Third week	1	4	5	80.0
Fourth week	1	1	2	50.0
Fifth week	2	3	5	60.0
Sixth week	3	0	3	00.0
Ninth week (relapse)	0	1	1	100.0

(Stage of disease not recorded in one patient who recovered.)

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THE DIAGNOSIS AND TREATMENT OF SYPHILITIC LESIONS OF THE NERVOUS SYSTEM.[1]

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It is of the utmost importance to make the diagnosis of syphilitic lesions of the nervous system as early as possible, for it is in the primary stages that therapeutic measures are of most benefit. That the diagnosis of such lesions presents many difficulties is evident, since there is no part of the nervous system that may not be attacked. Certain symptoms are present, however, in nearly all cases, and it is principally by the recognition of these that we are able to make a proper diagnosis. The better to understand what symptoms are possible in syphilis, an effort will be made to trace the course and nature of the disease and the method of involvement of the nervous system.

In only a few of the large number of persons infected does the nervous system become secondarily diseased. The important question, then, is, Why should one person have his nervous system affected and not the other, and what influence, if any, does treatment have upon the prevention of such involvement?

Repeated instances have been recorded in which a number of persons not at all related have become infected from the same source and subsequently developed general syphilis and, later, specific disease of the nervous system. Here there are two possibilities: one, the most probable, that the specific infection was of such character that it had a special affinity for these structures; and second, that there was lessened resistance of the nervous system to the infection. It has always been one of the old theories that only certain forms of specific intoxication will cause disease of the nervous system; the best proofs of this have been such instances as quoted above. That such is the case there can be no doubt, but such a theory will hardly answer for all cases. There is no question that specific manifestations at the present time are not as severe as they have been. This is due partially to the better recognition and earlier and better treatment of the disease, and also to the fact that all diseases have a tendency to lessen in intensity in the course of time.

It is probable that the most important factor which determines whether the infected person will have future involvement of the nervous system is the lessened resistance of these structures, or possibly a special predisposition. Just what determines this is, of course, difficult to tell, but it must be that certain parts of the anatomy are less resistant than others. Hereditary and family influences contribute to this to a large degree. Erb records instances of specific infections in families in which all had tabes dorsalis following infection from the same source.

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[1] Read by invitation at a meeting of the Lackawanna County Medical Society, Scranton, Pennsylvania, October 22, 1907.

It is of importance to know in what percentage of cases of syphilis the nervous system becomes diseased. This can never be determined with accuracy, and we must rely principally upon the statistics to be obtained from institutions. Erb, for intsance, collected some years ago a history of many cases of specific infection, and of these, in about 1 to 5 per cent. tabes followed. In how many, however, there were other involvements of the nervous system is not recorded, but judging from the fact that tabes is no more frequent than other cerebrospinal diseases, it is probable that a fair percentage would be about from 5 to 10 cases in 100. This, of course, is only conjecture.

It is also a question whether or not early treatment of the disease will prevent such future involvement. That it does so in the majority of cases there is no doubt, but in many instances it is of no avail. In one case, a physician who was infected in his finger, the most active treatment was immediately instituted and faithfully kept up for three years. While still taking medicine, three years after the infection, the patient suddenly had diplopia, which was followed by other basal symptoms, this terminating, in two years, in multiple cerebrospinal symptoms and finally in death. In another case, also a physician, who was similarly infected, the symptoms of basal involvement appeared a year after the infection, while he was undergoing the most vigorous treatment. The disease is still progressing, and antispecific treatment seems of no avail. These two acute cases are quoted, among others which have occurred in my experience, to show the uselessness of treatment in certain forms of syphilis.

It is, however, in the more chronic cases, or in those in which the symptoms of cerebrospinal involvement appear many years after the infection, that this question arises. In many, antispecific treatment had been instituted and carried out vigorously, and the patient pronounced well, only to have some part of the nervous system become diseased years afterward. The conclusion is forced upon us that in some forms of syphilis the cerebrospinal system will become diseased whether or not treatment is instituted, and no matter how vigorously.

After an infection the nervous system may be involved almost immediately, in the midst of treatment, or may not for some years, sometimes as many as twenty. It is generally supposed that the earlier the cerebrospinal symptoms appear the more severe the infection. Considering, however, that the symptoms produced years after the infection are about of the same severity and character as they are in the early periods, there is probably little difference.

Pathologically, in the early forms, no matter where the nervous system is involved, there is always a round-cell infiltration about the bloodvessels and in the pia, this being especially true of the base of the brain and the posterior part of the spinal cord; and there is also a secondary endarteritis and permanent thickening of the meninges. Rarely, small gummas will be found, but these are not as frequent in the nervous system as is commonly supposed. More rarely, there is also an involvement of the substance of the cord or brain. When such is the case, in the former there is very often a total inflammation, this resulting in myelitis; if in the brain, the cortex and subcortex are diseased, this causing the symptoms of diffuse encephalitis. It is characteristic of these acute inflammations, such as myelitis and encephalitis, that the symptoms appear suddenly.

When this disease comes on many years after the infection the usual pathological findings consist in a sclerosis of the vessels and thickening of the meninges, and sometimes in gummas, but it is principally to the results of the endarteritis that the symptoms are due. There are, however, other forms of disease resulting from specific infection which are caused not by inflammation, but by gradual changes in the nervous structures, thought to be the result of toxins. These changes mostly occur in structures which have more or less functional relation, and are called systemic, the best example of this being locomotor ataxia or tabes dorsalis.

It can be readily understood, then, that, so far as the symptoms of specific disease of the nervous system are concerned, the majority of cases will show an involvement both of the brain and of the spinal cord, and that the focal symptoms will depend upon what particular portions of these structures are most diseased. No matter what the extent of the affection, there is in every case an infiltration of the meninges, and this in itself will nearly always give certain symptoms. There is a tendency, however, for certain forms of involvement in those cases in which the symptoms manifest themselves within a few years after the infection, and these will be discussed first.

Among the earliest is a myelitis, this usually coming on suddenly and in most instances affecting the lower thoracic or thoracic-lumbar region, and often giving the symptoms of a complete transverse myelitis, there being loss of power in both lower limbs, of the bladder and rectal functions, and of sensation. In the majority of cases some return of power can be hoped for, especially if vigorous treatment is promptly instituted. Added to the symptoms of the myelitis there will be those of meningeal involvement, such as girdle sense and pain.

Other common early manifestations, sometimes appearing in the midst of treatment, are those the result of multiple lesions of the brain and cord, giving diffuse symptoms depending upon the location of the lesions. There will nearly always be motor and sensory involvement of irregular character, with the addition of meningeal symptoms of the base of the brain and of the cord.

Hemiplegia is also common in early syphilis, this resulting from early endarteritis. In fact, hemiplegia occurring in young adults below forty years of age, is nearly always syphilitic in origin, but the most common manifestations of syphilis are those the result of meningeal involvement of the base of the brain or of the spinal cord.

Meningitis of the base of the brain is nearly always greatest around the chiasm, and it is because of this that the optic, oculomotor, and sixth nerves are commonly diseased in syphilis. Whether it is because of this involvement of the optic nerves, or because the specific toxin has a special predilection for the iritic muscles, disturbances in the reactions of the pupils with irregularities in their margins are the most common and constant symptoms of syphilis. Such general diseases as syphilis nearly always affect those structures which are most commonly used, and it is, perhaps, because of this that the iritic muscles are so early diseased. In most instances there will be found irregularities in the margins, with a slow reaction of the pupils both to light and to movement of the eyeballs, and sometimes, in the later stages, a failure of response of the pupils to light, with preservation to movement of the eyeballs, or the Argyll-Robertson pupil. There is no disease which will so constantly give these symptoms, and there are no symptoms which are so constant or which can be so much depended upon.

Oculomotor palsy, unilateral in type, occurs most frequently in syphilis. In fact, it has been termed its *sign manual*. Of the cranial nerves, however, the sixth nerve is probably the most frequently diseased, it causing double vision. This, as a rule, lasts only a very short time, appearing and reappearing, until finally it will be permanent. Paralysis of any of the other cranial nerves is a rare manifestation. Meningeal involvement in the spinal cord is nearly always greatest in its posterior portion. Because of this, girdle sense and pains referred to various parts of the limbs are common symptoms.

Of the diseases which have a tendency to become manifest many years after the infection, that is, after the fifth year, while there is in every case an affection both of the brain and the spinal cord, there is nearly always a preponderance of the disease in one of these structures. When the brain is mostly involved there will be, besides the irregularity of the pupils and the slowness of reactions to light and movement, other symptoms depending upon the location of the lesion. These may consist of a gummatous deposit in most any portion of the brain or of a basal infiltration, besides those diseases resulting from the early endarteritis. For instance, a man, aged thirty-two years, began to have headache, nausea, some dizziness, with disturbance of the sense of position, of movement and localization in the right upper limb, and inability to recognize objects placed in this hand. A tumor, probably a gumma, was present in the left parietal cortex. Mercurial inunctions caused total disappearance of the symptoms, with some remaining pupillary irregularity.

An example of cortical meningeal involvement, with the addition of gummatous deposits in the brain tissue, is that of a man, aged forty-five years, already reported, in which there was present the symptoms of a lesion in both the parietal and the motor area. The patient had Jacksonian convulsions in one upper limb, accompanied by the most excruciating pain, which was followed by a loss of power and increased reflexes, besides the usual symptoms of brain tumor. This man was operated upon twice and considerable gummatous tissue removed. At necropsy an extensive meningitis was found over both sides of the cortex, the meninges in places measuring almost one-half inch in thickness. Besides, the brain was infiltrated with gummatous deposits and the skull was carious almost in its whole thickness.

An example of basal involvement, this probably affecting the meninges and also the pons, is that of a physician, a man aged forty years, who, two years after infection, became gradually stupid and dull and had to abandon his practice. He then developed difficulty in talking, eating, and swallowing, and weakness in the right half of the body, besides paralysis of the fifth and sixth nerves.

Syphilis may sometimes cause the general symptoms of brain tumor without any special localizing phenomena. Such, for instance, is a man, aged forty years, who developed, some years after specific infection, headache, nausea, vomiting, and bilateral choked disk. Besides, the pupils were irregular and the reactions slow. Antispecific treatment in this case has proved of the greatest benefit. In another case, studied in the Philadelphia Hospital, and subsequently reported by Dr. Mills, a young man had all the symptoms of a cerebellar tumor, only to find at necropsy multiple gummatous deposits throughout the brain.

It is characteristic of brain symptoms, just as it is of those the result of basal lesions, that they may appear for a time and then disappear, only to reappear again and remain more or less permanently. Such was the case of a young woman who, when seen, presented all the symptoms of acute confusional insanity. Physical examination, however, disclosed irregular pupils, with slow reaction to light, and the history, as obtained from one of the parents, of temporary diplopia, associated with motor aphasia and some difficulty in writing. Both the aphasic symptoms and the difficulty in writing remained only for a short time and then disappeared. A diagnosis was made of a specific disease, this being based upon the pupillary condition and temporary appearance of symptoms. Later, specific disease was acknowledged.

The above cases are quoted, among others, as examples of the different lesions that may be expected in syphilitic disease of the brain. The characteristics of all were a more or less gradual appearance, and, besides the definite symptoms due to focal involvement, the presence of the pupillary irregularities and disturbance in their reactions.

In those instances in which the spinal cord is mostly involved there may be very diffuse symptoms, but in nearly all there is some meningitis, this causing girdle sense and pains. That the symptoms, however, may be diffuse, is exemplified in the following case:

A man, aged forty-three years, began with weakness in the right leg, which was followed by pain in the right buttock and along the course of the right sciatic nerve, accompanied by a feeling of numbness in the whole right lower limb and a tight feeling across the knee. The patient's attitude and gait were such as are present in sciatica. He also had irregular pupils with slow reactions, and a history of temporary diplopia. The case was variously diagnosticated at different times, and both a spinal cord tumor and hip-joint disease were suspected, but after having been placed on mercurial inunctions, he became entirely well.

Another case is that of a man, aged thirty-one years, who had rheumatic pains in the left thigh and left lower limb, with pain along the sciatic nerve. This limb was weak and somewhat atrophic and the tendon reflexes were absent. He had, besides, the usual specific pupillary phenomena. Under mercurial inunctions the symptoms disappeared almost entirely.

In the following case the symptoms were almost totally confined to the bladder functions: A man, aged about forty years, six years before observation, began to find it necessary to urinate oftener than normal, this frequency steadily increasing. When examined there were no other symptoms present besides the irregularity of the pupils, with slow reactions to light and to movement. Under antispecific treatment the bladder symptoms are steadily disappearing.

Disturbances in bladder and rectal functions, especially the former, are very common in spinal specific infections, but sometimes, as in the case quoted above, they may be the only symptoms indicating such disease.

The above three cases are quoted as being typical of spinal specific disease. In all there was a preponderance of meningeal symptoms, with disturbance of either bladder or rectal functions, with the addition of pupillary symptoms, and it was upon these that the diagnosis of syphilis was made.

Cases are observed in which there seems to be an equal involvement of the brain and the spinal cord, but even here one of these structures may be more diseased. The symptoms will, as a rule, be multiple, and there will be, besides the specific pupillary phenomena, disturbance of mentality, irregular motor and sensory symptoms, and involvement of the bladder and rectum.

An example of such a case is that of a farmer, aged forty-two years, who began with weakness and numbness in the lower limbs, with increased urination and constipation, loss of memory, and changes in disposition. Examination showed, besides motor and sensory symptoms, irregularities of the pupils. Antispecific treatment in this case was not of much value.

So far, only those cerebrospinal syphilitic diseases have been discussed which are the result of the direct pathological processes produced by such infection, while other diseases, as general paresis, tabes dorsalis, and posterolateral sclerosis, are supposedly produced by its toxins. Their symptoms, as a rule, come on many years after the infection, at least so far as their appreciation is concerned. It is curious that a person may be infected with syphilis and have no symptoms for a number of years, and then may develop posterior sclerosis. This does not seem logical, and it is probable that if our methods of observation were better we should be able to demonstrate some symptoms, for the syphilitic toxin does cause early and constant changes.

That such is the case has been demonstrated in more recent years by the examination of the cerebrospinal fluid. It has been found that in such diseases as tabes dorsalis and general paresis, in which it is supposed that the cause is specific, there is always an increase in the lymphocytic elements. Indeed, recently a certain form of Spirochæta pallida, which is supposed to be the cause of syphilis,. has been demonstrated in the cerebrospinal fluid. This increase in the lymphocytic constituents occurs in other diseases, and as yet cannot be absolutely depended upon. At a recent meeting of the Philadelphia Pathological Society, Dr. Simon Flexner demonstrated a rapid method of obtaining Spirochætæ pallida from primary and secondary manifestations. At necropsy this organism has been found in gummatous deposits of the brain and cord, and it is probable that, if carefully looked for, it will be commonly found. So far as an aid to the clinical diagnosis of this disease, examination of the cerebrospinal fluid, while of great, is not as yet of positive, value.

Treatment. It is in the early stages of this disease, in the period of round-cell infiltration, that antispecific treatment is of the greatest benefit, and treatment should be promptly and vigorously instituted. The best results can be obtained from inunctions of mercury, a dram a day, to be rubbed in in different places. The best plan to follow is to apply this daily, with the exception of Sunday, and to keep it up for a period of about six weeks; if any improvement can be hoped for, it will be manifest in that time. If, at the end of this period, there is no improvement, such treatment might as well cease.

It is always a good precaution to have the patient's teeth carefully looked after before treatment is instituted. During the treatment a borax mouth wash should be used, and the patient not allowed any dietary indiscretions, although special dieting is not necessary. It is also advisable to take the patient away from all work, hospital treatment being the best. A hot pack, given about two or three times a week, will aid in the absorption of the mercury.

It has been my experience that whenever any benefit has been obtained, it has been the result of the use of mercury, and not of iodides. Even in the specific manifestations which come on many years after the infection, mercury is the only drug which will be of benefit. Iodides probably do good, and should be given either in conjunction with the mercury or, better still, after the mercurial treatment. It is a good plan to give them in increasing doses, 50 to 70 grains a day being quite enough. The habit of giving large doses of iodides is quite prevalent in this country, while abroad smaller doses are the rule.

THE NEURASTHENIA OF AUTO-INTOXICATION.

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The symptom-complex of neurasthenia may be likened to a fairly well-defined body of water fed by many underground channels that in their turn flow from hidden sources. One of the largest of these tributaries is heredity, which is fairly well charted. Besides this there are, doubtless, many others. Of these I believe a very important one, indeed, has its source in gastro-intestinal auto-intoxication.

There are two ways by which man may be poisoned—either by a poison from without or by a failure to get rid of the poisons that are formed inside him, provided it is possible for the body to take them up again.

That neurasthenia may be caused by the former has been accepted. Can it be induced by the latter? Before answering this it will be necessary to answer the following questions: Does the body form poisons within itself? If so, where may they be found? May they be taken up again into the body owing to a vicious condition of the bodily hygiene or a pathological condition of certain secreting surfaces? If they may be so taken up, will they give rise to the symptom-complex of neurasthenia?

On the one hand Oppenheim[1] distinctly and explicitly stands for the negative. He says: "The opinion that this disease (neurasthenia) is due to auto-intoxication resulting from disease of the gastro-intestinal tract does not seem to me to be sufficiently well established." He does not even refer to the urinary findings and their relation, in neurasthenia, to intestinal putrefaction

There is a middle ground to this subject, where many teachers are found. Osler[2] does not mention auto-intoxication as a cause of neurasthenia. Like Oppenheim he seems to look upon neurasthenia as a disease of the mentality caused by worry, overwork, and the like; or else the neurasthenic condition is produced by certain poisons from the outside—such as morphine, cocaine, and alcohol. He refers to gastro-intestinal neurasthenia as nervous dyspepsia and says it is due to worry or nerve tire. No mention is made of the urinary findings in the disease or the fact that they may point the way to one of its causes. Musser[3] does not mention any connection between neurasthenia and auto-intoxication, nor does he deny it.

Bouchard[4] as distinctly affirms as Oppenheim denies that auto-intoxication is an important cause of neurasthenia. So much for the academic side of the question.

Does the body form poisons within itself?

Referring to indicanuria, Musser quotes von Jaksch who states that large quantities of indican in the urine imply that abundant albuminous putrefaction or putrid suppuration is in progress in the system. Musser adds that it must not be forgotten that indicanuria will often arise in simple constipation. Osler tells what indicanuria is, states the origin of the indican and says it is a product of the decomposition of albumen under the influence of bacteria. He leaves the subject there.

Boas[5] quotes Jaffe, Salkowski, Bauman, Brieger, and Senator to prove that indican in the urine is derived from the intestines and is a normal product, but becomes pathological in excess. It is normal from 5 to 20 mg. daily; pathologically, it may reach 100 to 150 mg. Nothnagel[6] quotes Jaffe, who observed that obstruction of the small intestine causes marked increase of indican. Constriction of the large bowel does not cause so much increase. Indican is increased in diarrhœa as well as in constriction and constipation due to bowel stasis, provided the small intestine is at fault, that is, in typhoid when there is disorder of the mucosa, and in other diseases confined or localized in the small intestines. Ortweiler found that increased peristalsis alone does not necessarily cause increased indican in the urine, and may cause its absence owing to the sweeping away of the putrefactive material in the intestines.

From all of this it seems certain that the body does form poisons within itself. What are these poisons and may they be taken up by the body instead of being expelled as they should be?

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[1] Diseases of the Nervous System.

[2] Practice of Medicine.

[3] Medical Diagnosis.

[4] Auto-intoxication in Disease.

[5] Diseases of the Intestines.

[6] Diseases of the Intestines.

Bouchard has isolated seven distinct poisons in the urine alone, and shows their action on living tissues. He proves the toxicity of the blood itself in its capacity of carrier of the poisons to the various excretory organs. He convicts the bile of a tremendous toxicity. Graphically, he gives the relative toxicity of urine and bile and shows mathematically that "if all the bile secreted by the liver passed directly into the blood of a man he would be poisoned by his own bile in less than nine hours. If all the urine that his kidneys secreted passed directly into the blood he would be poisoned by his own urine in two days and six hours." He goes minutely and exhaustively into the subject of auto-intoxication, and leaves not a doubt of it in the reader's mind. Müller and Ortweiler consider it certain that the absorptive faculty of the bowel plays the prominent part in the transfer of poison to tissue.

It seems, then, that the body does form poisons within itself, that they may be found in the urine, bile, venous blood (especially just before it gets to the liver), and in the arterial circulation itself; likewise, that these poisons have been taken up from the gastro-intestinal tract and are constantly in the process of being excreted by the various emunctories. In the healthy man compensation is balanced; the out-go equals the amount formed. But, if any one or more pathological conditions exist—a failure to throw off the various poisons in adequate amounts, loss of the integrity of some mucous surface, stasis in the small bowel from any cause, an excessive intake of vicious material—what then occurs? The intestinal tract is an ideal laboratory for the growth of bacteria. It is a flexible tube, accessible at both ends, kept at a certain temperature and filled with the materials suitable for putrefaction. A large section of it is lined with a secreting surface. It does not take much imagination to picture the condition of the man who is absorbing more of these various poisons than be can throw off. The symptoms would naturally vary in degree and severity according to the individual's personal equation, the excess of poison, and the susceptibility of his tissues.

While it would be ridiculous to assert that every neurasthenic is such because of absorption of toxic material, in other words that auto-intoxication is its only cause—yet it does not seem ridiculous to claim that very many neurasthenics are such wholly or in part owing to auto-intoxication, when we realize the chances at hand for inducing this condition and consider what the results of it would naturally be. This hypothesis is confirmed and strengthened by clinical experience. In this connection I wish to cite an instructive case:

Case I.—C. P., was twenty-nine years old when he came to me. His occupation is sedentary, although he gets plenty of out-of-door exercise. His family history shows a distinct mental taint on the maternal side. Otherwise the history is good.

He had pleurisy, scarlet fever, and typhoid fever fourteen, eleven, and eight years ago, respectively. Coming, as they did, in the time of his adolescence they may have had a good deal to do with his case as predisposing factors. His general health, other than these, has been good up to about two years ago. There is no history of venereal disease or sexual excess. He has enjoyed plenty of out-of-door exercise—especially rowing and walking.

For about two years he has complained of not feeling well. When asked to be more explicit he said he felt sleepy most of the time, complained of a lack of tone and inertia associated with mental heaviness, constant fagged-out feelings, fulness in the head, and a generally tired-out feeling. He cannot exert himself or do things with any degree of enthusiasm as he would like to do and used to do. He has headaches and neuralgias. He becomes very much depressed at times and does not feel the normal mental exhilaration and joy of life he was accustomed to feel. He has no cause for worry and his work is not exhausting. His bowels are generally constipated. He says he has noticed a lump in the right abdominal region that varies in size from time to time. He has gone the rounds of physicians and has been treated accordingly.

His condition has been diagnosticated neurasthenia, hysteria, general nervousness, and hypochondriasis by competent observers of repute. He says that if his present condition should continue much longer he would feel that life would be too much of a burden.

His muscular condition is excellent—no flabbiness, no pendulous abdomen. The heart and lungs are normal. There is no abnormal position of any of his organs. The tendon reflexes are active but not exaggerated. He exhibits a pretty constant series of habbit spasms, especially of the orbicularis palpebrarum and facial muscles. These express themselves at times as grimaces and are bilateral. There seems to be a desire to keep certain of the eye muscles on the stretch. He has had a number of attacks of sciatica and as a result there is some spinal curving. Peristalsis is sluggish as demonstrated by the phonendescope. Rectal examination shows some dryness of the contents and a good deal of adhesion of fecal material to the bowel walls. The sphincter muscles are exceedingly active and over-tense. The eyes were examined by Dr. J. T. Carpenter who reported that the examination was negative as far as it showed no adequate cause for his nervous condition.

The examination of the urine was negative as far as the ordinary clinical technique goes and showed no abnormality.

Here was a case of, so-called functional, neurasthenia; it had the symptom-complex without adequate anatomical findings to account for them, apparently.

The treatment was directed at the condition of constipation. The result was good, as far as it went; some increase in weight, a better hygienic condition of the bowels and kidneys. It was not satisfactory, however, as no definite demonstrable cause for his trouble had been found.

A more extended examination of his urine was made and at once pointed to the real cause. There was a report from the Philadelphia Clinical Laboratory of "very high quantity of indican for normal twenty-four-hour quantity of urine." He was passing about fifty ounces daily. Thus, it was pointed out, there were two large causal factors in the case to be considered—heredity and auto-intoxication.

Another physical examination was made to find, if possible, any anatomical basis for bowel stasis or obstruction. The abdominal lump was recalled and the patient directed to return at its next reappearance. This he did and a movable, balloon-like tumor was marked out in the region of the appendix. It was partially collapsible, but not entirely removable by palpation. Two high enemas were injected to clear out the lower bowel and aid the examination. The notes read "the water ran in easily traversing the descending, transverse, and ascending colon in turn arriving at the cecum. After the water was evacuated examination showed an irreducible mass in the region of the appendix. The bowel was flattened and the mass distinctly felt rolling under the fingers." Subsequently, four examinations of the urine exhibited indican in excess.

The facts were these. There was a constriction in the neighborhood of the appendix resulting in bowel stasis. This was considered sufficient to set up intestinal putrefaction with absorption of the resulting poisons; these, in turn, were held responsible for his neurasthenic condition.

Dr. John Gibbon was consulted. His examination fully upheld the diagnosis and his opinion was that the nature of the obstruction was the presence of adhesions in the appendicular region. We held to this although there was no history of appendicitis or acute pain in that part of the abdomen. A second examination was made a month later and the same condition found.

Operation was advised and carried out. The notes of it include the following: "The bowel and appendix were exposed. The latter was long, twisted, and bound to the former by adhesions. The bowel was much constricted by these adhesions. Nothing else was found to be abnormal; the kidney and gall-bladder were in a good position. Adhesions were broken up and the appendix removed. The tip of it was quite injected with hemorrhagic spots, but otherwise normal. In addition to the operation the sphincter ani muscle was thoroughly stretched. Just prior to the operation a differential blood count was made in the Pennsylvania Hospital laboratory; this was normal. Nine days after the operation the urinary indican was about normal. One year later the report is: "Examination of the urine shows no excess of indican." The patient is feeling like a new man and has recovered entirely his joy of living, enthusiasm, and right feeling—and he has not changed his occupation or mode of life, except that his bodily hygiene is kept as it should be.

This is the record of a case of neurasthenia due to auto-intoxication. It had persisted for years until the cause of the auto-intoxication was removed and then cleared up.

I have appended eight cases (including the one herein enlarged upon) of neurasthenia occurring in private practice in Philadelphia, in which the symptoms pointed to auto-intoxication and the diagnosis was corroborated by the urinary findings. Of these two have been cured and are entirely free from symptoms. One may be called very much improved—in this case there have been no symptoms for some months, but this is hardly long enough to enable one to claim a permanent cure as yet. Three have been improved by a course of treatment directed against the condition of bad bodily hygiene. Two have not been under treatment long enough to make any claims as to results. There is great satisfaction in finding a tangible cause for these cases that are without anatomical findings—a sign post that may point in the direction of health to many otherwise chronic cases.

One point in addition to this question is pertinent: Why is it that, when the urinary findings begin to indicate that the poisons of putrefaction are no longer excessive, the neurasthenic condition continues, in many cases, for a long time? I wish only to touch on one point relative to this—on the withdrawal of a poison that has been absorbed for a long time, the nerves seem to cry out in distress. This is a common experience and may have some bearing on these cases.

Case II.—M. J. O'M. Male, aged thirty-five years, occupation architect and builder. Generally very healthy. He has been a regular but never an excessive drinker of alcoholics, an excessive smoker for years, and inclined to worry over trifles even though his business has prospered.

In February 1906, following a spell of continuous hard work, he began to feel tired, irritable, and unable to do his work satisfactorily. This was associated with a nervous dyspepsia and backache in the lower dorsal region. He was possessed by terrors of various kinds, especially if left to himself. His heart would palpitate easily and that would increase his fear.

His weight is 174½ pounds. General physical condition is good. His abdomen is pendulous, and there is a slight lateral curvature of his vertebral column. All his reflexes are exaggerated and jerky.

Report of urinary examination by the Philadelphia Clinical Laboratory: "Indican is high for normal twenty-four-hour amount of urine; otherwise normal."

Treatment consisted in correcting the spinal asymmetry and overcoming the sluggish tendency of the bowels by massage, medication, rest, and change of scene. He has become entirely well.

Case III.—Mrs. C., aged forty-three years. Father died of nephritis and cirrhosis of the liver. Her mother has diabetes. Pneumonia at ten years of age; diphtheria twice; whooping-cough and measles during early childhood.

As a young girl she was very active and easily overwrought. When about eighteen years old she had nervous prostration. Since then she has had attacks of nervous dyspepsia. She has grown quite stout in late years. During the last six months she has had persistent constipation, mental depression, intense lassitude, and headaches; gets tired upon slight exertion. With this there has been a harrassing fear of being alone or in the country and a feeling that she must be constantly on the go even though felling tired out.

Weight 185 pounds (30 pounds too much). Abdomen pendulous and abdominal muscles flaccid and atonic. Conjunctivæ are congested and icteric; tongue coated. Reflexes are very jerky.

Urinary examination by Philadelphia Clinical Laboratory, November 8, 1906, showed: "Total amount of twenty-four-hour urine 500 c.c.; marked increase in indican; slight increase in phenol; total sulphates equal 1.33 grams; conjugate sulphates equal 0.177 gram; preformed sulphates equal 1.153 gram; ratio of preformed to conjugate equal 6.5 to 1; normal ratio is 10 to 1."

Although there was no *actual* increase here in the amount of sulphates excreted there was a relative increase in the conjugate over the preformed. This goes hand in hand with increase in indican and phenol and helps to confirm the diagnosis of intestinal putrefaction.

Treatment consisted in correcting the intestinal sluggishness, by intestinal antisepsis, appropriate diet and exercises, together with massage.

The report of urinary examination, January 15, 1907, was normal except a slight deficiency in amount; she had increased the amount from 562 to 900 c.c. Her general condition was better in every respect. Her weight fell from 185 pounds to 174¾ pounds. There is yet a good deal to be done before she feels normal—habits to overcome, etc.

Case IV.—Mrs. B., aged twenty-eight years. Father died of fatty degeneration of the heart. Her mother is of a distinctly hysterical make up and always has been. Even when Mrs. B. was a child her mother made no attempt to control her outbursts. She was born at seven months. Has always been constipated. As a child she craved "sweets" and was allowed to eat them at will. She has never been robust though she has never been severely ill. She was married at twenty-one years of age and become pregnant three years later; during her pregnancy she felt better in every respect.

From childhood she has suffered from apprehensions. Has always been very impressionable and in later years this has led toward hypochondria. At times she has the feeling of a tight-band about the head; she becomes very depressed and weeps easily. There have never been true delusions or hallucinations, although about six years ago she began to be suspicious. This passed away. She is very thin. Her abdomen is pendulous. The left kidney is much too low. Heart and lungs are normal. Reflexes are generally somewhat increased. There are no hysterical stigmata other than the "fillet."

Examination of urine shows a trace of albumin and indican in excess; otherwise normal.

Case V.—Mrs. B., aged forty-one years. Mother died of gastro-hepatic intestinal disease. Father died of a complication of grip, erysipelas, and senile dementia.

Was married at twenty-two years of age; before this she was always healthy. Since the birth of her first child she has never been well. She had five pregnancies in eight years. About one and one-half years after the birth of her last child she had purulent salpingitis and was operated upon; both tubes and ovaries were removed. She was in bed eighteen months. At this time she was dropsical. It was several months later when she began to walk about. Shortly after she began to walk she developed hystero-epilepsy. During some of the attacks she would fall and has broken various bones. These lasted for nine years after which their character changed—at times she has intense pseudo-angina following the attack, at other times she comes out of them quietly. About this time she developed marked dyspeptic symptoms with constipation. For the last three years she has had constipation and diarrhœa in turn. When constipated there is intense headache with nausea and vomiting associated with scanty urine. After the diarrhœa there is free micturition and relief from headache. She complains of mental depression, inability to attend to her household duties, and intense headaches. There is considerable ballooning of the bowels at times.

Examination of urine showed indician "high for twenty-four-hour amount."

Treatment was directed against the intestinal putrefaction with the result that she no longer has the epileptoid attacks, is almost entirely free from her headaches, and is able to attend to her duties. I showed this woman to Dr. Wm. G. Spiller, who concurred in the diagnosis of hystero-psychic-epilepsy with intestinal auto-intoxication as its basis.

Case VI.—Mrs. C., aged thirty-eight years. Good as to health; both parents were emotional. She was perfectly well up to fifteen years of age when she had a "nervous breakdown." This was characterized by unreasoning fears of various kinds. There were no hallucinations or delusions. She had fits of depression and crying. This lasted about one year and there were hysterical stigmata exhibited, that is, spells of apparent unconsciousness that were not epileptic. She was married at eighteen years of age; has never been robust since. At times she will feel quite well and then have a period of nervousness and mental depression. She complains of lassitude, tired feelings, mental depression, and fear—fear of crowds and being alone. Her mode of life does not account for them—there is no apparent cause. Her symptoms have been more severe for the last two years. Her bowels have been very irregular up to two months ago; since then they have been regulated by internal treatment. Sleep is very unsatisfactory and appetite poor.

General physical condition is good. Eyes are watery. Conjunctivæ are hypesthetic. Reflexes are exaggerated. Heart and lungs were normal.

Examination of urine at the Philadelphia Clinical Laboratory shows a trace of albumin and indican high for twenty-four-hour amount of urine. Otherwise it was normal.

Treatment was directed against the intestinal putrefaction and urinary insufficiency, and the result has been very satisfactory as far as it has gone—the length of time has not been sufficient to prove permanent good.

Case VII.—Mrs. S., aged thirty-four years. Mother died of cancer. Father alive. One sister died of tuberculosis. One sister and three brothers are alive and healthy. From childhood she has been of a very neurotic disposition. Up to her first menstrual period she had what she calls "spasms;" during them she was unconscious. These lasted from her ninth to her fourteenth years. For the last nine years she had fits of mental depression. About one year ago she had a hysterical attack in which she lay for a time in a trance-like state, unable to speak but conscious of surroundings. Since then, after each menstrual period, she has had severe headaches, vomiting, hysterical spells in which she lies as if in a faint, but conscious of everything. She complains of being easily tired, of inability to concentrate her thoughts, and of numbness and tingling in her fingers. She is habitually constipated and passes but little urine. She complains bitterly of headache and dizziness, and fears she will become insane. Her emotions are easily aroused and she cries at the least provocation.

Patient is 25 pounds over weight. Her heart is inclined to tachycardia. Breathing is sighing at times. Abdomen is pendulous, flabby, and fat. Otherwise her condition is normal except certain stigmata of hysteria, such as hypesthesia of half her body, irregularity of color fields, diplopia at times.

Treatment was directed against her constipation and likewise against the hysterical element that was so prominent in her case; she promptly recovered from the latter. In time the proper hygiene of her intestinal tract and kidney elimination bore fruit, and she become free from the neurasthenic element as well.

Case VIII.—Mrs. W., aged thirty-six years. Both parents were rheumatic. Her father had heart and kidney disease.

She has been married seventeen years. Seven years ago she was operated upon for the removal of one ovary. The same year she developed asthma which has been present at times ever since. She has always been of a nervous, worrying disposition.

Complains of asthma, mental depression, and fits of crying. She is easily tired. She has worried a great deal about her husband's health. Her bowels are constipated and she is passing only thirty-two ounces of urine in twenty-four hours.

Her symptoms are not attended with much distress, but are gradually becoming more severe. Heart and lungs are normal. No abnormalities of position of viscera noted. Abdomen is pendulous. There is some asymmetry noted. There are no gross stigmata of hysteria.

Examination of urine at the Philadelphia Clinical Laboratory shows indican very high; otherwise normal.

After treatment that was principally dietetic and hydrotherapeutic together with massage and regulated exercises, she became much better. Nine months later examination of her urine showed a normal output of indican.

In the above cases certain points stand out prominently. The first is hereditary taint and a neuropathic susceptibility. The second is the symptom of fear in its various phases—so common in intestinal diseases. The third and most important as far as treatment is concerned, is the constant condition of intestinal putrefaction that has had to be covercome before any relief was achieved; this was in many of the cases associated with insufficient elimination of urine. In cases of this kind there is often a hysterical taint engrafted on the original trouble that must be considered in treatment.

THE INDICAN REACTION AS EVIDENCE OF ENTEROGENIC INTOXICATION.

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It is conceded that there is great danger in removing any symptom from its clinical surroundings for the purpose of weighing its intrinsic worth; but if there is sufficient evidence to formulate working rules, that danger should not prevent us from seeking to study limitations. The danger is probably no greater with any other clinical test than it is with the Jaffé or Obermeyer reaction in the urine. Indican is present in excess so frequently, not only as evidence of a primary pathological process, but of a complicating condition, that its very frequency leads to misinterpretation.

Further reason for this inquiry is found in the fact that the indican reaction is really the only test available to the general practitioner as an index of enterogenic intoxication.[1] Partition estimations of the sulphuric-ether excretion in twenty-four hours may be exceedingly valuable, but such work is ordinarily out of reach. The same may be said of bacteriological or chemical examination of the feces. Estimations of sulphur intake with the food and its ratio with the sulphur of the urine are usually limited to institutions for medical research. Furthermore, a few observations have been published which make one feel that the simple indican test is a better clinical indication of intoxication arising from putrefactive processes in the intestine than other more refined methods; or at least is a better indicator of the capacity of the organism to assimilate nitrogenous food.

The following evidence is presented in the hope that it will stimulate interest and confidence in the Jaffé and Obermeyer tests. It is drawn largely from laboratory observations, because of the general pessimism which exists among many such workers as to the value of the indican reaction. Precision tests should be devised as soon as possible, but in the meantime walking with a crooked stick is better than stumbling with no stick at all. No attempt will be made to discuss the interpretation of excessive urinary indican. That is a matter of clinical experience. But if some knowledge can be gained of the origin and the difficulties which befall the precursors of indican in the organism, the interpretation will naturally tend toward truth.

The work of Ellinger[2] has removed any doubt which may have existed in the past as to the source of urinary indican. In those starving animals which could be prevented from eating their own feces, the indican reaction in the urine subsided and disappeared as death approached. It could therefore not be formed during the course of proteid metabolism. Gentzen[3] has proved that the injection of skatol-amino-acetic acid (the mother substance of indol) into the cecum was followed by an abundant indican excretion. If ingested with the food, or injected into the rectum, it was metabolized. Increased excretion of indican secondary to putrid empyema or putrefying fœtus *in utero* is of rare occurrence. It is not in this class of cases that the reaction is of assistance in diagnosis, while by no known means can the intestine as a source be excluded. Abscess does not cause it (Beckmann).[4]

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[1] The terminology is unfortunately ambiguous. Intoxications arising from saccharobutyric fermentations in the intestines are not considered, but only those arising from proteid putrefaction.

[2] Zeit. f. physiol. Chemie, 1903, xxxix, 44. Many animal experiments have been undertaken for the purpose of working out problems connected with the etiology and effects of gastrointestinal intoxications. It seems as if too much importance as applied to man has been attached to some of them, particularly to those which involve conditions in the intestine. The habits of different animals have marked effects on intestinal putrefactive processes. Dogs are very apt to excrete large quantities of indican. This fact is probably traceable to eating filthy food and their fondness for meats. Allowance should be made for these differences in habit and for the lack of exercise which most experimental animals experience.

[3] Ellinger and Gentzen, Hofmeister's Beitrage, 1903, iv, 171.

The formation of indol is, therefore, limited to the intestine, and it appears during the course of proteid putrefaction and as the result of microbic activity. The conditions which promote its formation are pertinent points for inquiry in considering the excretion of indican in the urine.

Chemical Considerations. On the rough average, the aromatic nucleus of the proteid molecule—of which preformed indol is a part —amounts to about 5 per cent. In some proteids it is absent (gelatin), while in others it may exceed that amount. If it could be assumed that disintegration of the proteid molecule under bacterial influences always took place along fixed lines, and therefore always led to the same end-products, the problem would be much simplified. It would be possible to work out with mathematical accuracy the amount of indol which could be formed from any given proteid.[5] This assumption is not possible. Under some circumstances no indol may be formed, while under different conditions indol may be formed to some extent at the expense of other end-products.

For reasons which will appear later, there are objections in applying these laboratory results too literally to putrefaction in the intestine. In case the end-products of bacterial digestion are not removed, as would obtain in the intestine (even if mixed fecal bacteria are employed and other conditions are imitated), there is a tendency for the activity of the bacteria to be limited as the end-products increase in concentration. Bacterial autolysis is undoubtedly favored; or further activity is expended in dissociation of substances already formed into the simplest end-products.

Indol formation, except in grossly pathological states, is confined to the cecum and the ascending and transverse colons. Not more than 14 per cent. of ingested nitrogen passes the ileocecal valve in approximately healthy conditions (Mayfadyen, Nencki, and Sieber[6]). This includes nitrogen in the form of true excrementitious matter derived from the mucosa above and the secretion of glandular organs contributory thereto. From 6 to 10 per cent. passes the rectum in the feces. It[7] is assumable that nitorgen in almost any form may be utilized by microörganisms, but only certain forms of proteid will yield indol under any circumstances. Many forms of nitrogenous matter reach the ileocecal valve, but only a few contain preformed indol, or are capable of yielding it. These factors would certainly affect the indican output, to what extent it is most difficult to estimate, except that the evidence seems to favor the view that as an end-product there would be a minimum production of indol.

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[4] St. Petersb. med. Woch., 1894, Nr. 28.

[5] Vide article by Fr. Müller in v. Leyden's Handbuch der Ernährungstherap., 1903, i, 162.

[6] Journ. Anat. and Physiol., 1890–91, xxv, 421. These figures must be taken with a great deal of latitude, as the conditions are probably varying. There is no more certain way of causing increase in indican excretion than by excessive ingestion of proteid food. On the other hand, this does not cause a *proportionate* increase in fecal nitrogen. The difference probably falls prey to bacterial activity as soon as the assimilation limit is reached.

[7] With regard to fecal nitrogen, it may be said that if a complete partition could be made in health and disease, it would give us much information as to the intensity of bacterial processes above. This would *not* be a measure of the intoxication. Only that part which is absorbed is concerned in the latter process. For this reason intestinal putrefaction in the maintenance of nitrogen balance is ignored, as the factors tend to balance each other to a small fraction.

Bacterial Considerations. According to the view originally advanced by Bienstock[8] and now generally accepted, Bacillus coli and other facultative aërobes which are "normal" inhabitants of the bowel, are regarded as defensive organisms as opposed to certain obligatory anaërobes (Bacillus aërogenes capsulatus, Bacillus bifidus, etc.), which are regarded as putrefactive organisms and capable of originating pathological putrefactive changes in the intestinal contents. Bacillus coli and its associates exist in a vegetative state, limited in their activities by a peculiar combination of circumstances and by active defences of the host. They expend most of their energy normally in propagation. They cannot attack native proteid, but do form indol. On the other hand, the obligatory anaërobes do disintegrate native proteid at the expense of some time and effort, but they are unable ordinarily to liberate indol (Rettger[9]). Putrefaction of proteid without anaërobes is impossible. Therefore indol formation results from the intervention of Bacillus coli and related forms, acting either on the products of anaërobic activity or on the products of normal proteolytic digestion which have passed along unabsorbed.[10] A good deal of stress is placed on this last point for this reason: ordinary attacks of biliousness in young people, accompanied by large indican excretion and resulting from overeating, presupposes, unless the above alternative be accepted, a complete and sudden change in the bacterial content of the bowel. This seems inconceivable, particularly as the condition yields to proper treatment in a few hours, which in turn presupposes quite as sudden a reversal in bacterial relations to the normal.[11] It is also possible on this hypothesis to account for other discrepancies in the theory of enterogenic intoxication, of which space forbids further consideration.[12]

[8] Arch. f. Hyg., 1901, xxxix, 390.

[9] Jour. Biol. Chem., 1906, ii, 71.

[10] There is some reason for believing that the production of indol as an end-product is dependent on the integrity of the pancreatic secretion, or at least on the ability of the gastro-intestinal secretions, to hydrolyze to the peptone stage.

[11] Vide Herter, Jour. Biol. Chem., 1906, ii, 65, §12.

[12] The products of proteolytic digestion—the carbon nuclei and particularly peptones—are themselves capable of causing intense inflammatory disturbances in the enteron, particularly in concentrated form. This is so well known among laboratory workers that certain types of experimental work cannot be carried on without strictest precautions. There is also a very sharp limit to the capacity of the small intestine to assimilate and rehabilitate carbon nuclei into body proteid. This is especially true if the mucosa is in a state of catarrhal inflammation.

Variations in the Absorptive Power of the Intestine for Indol. It is by no means certain that under strictly normal conditions the mucosa of the large intestine absorbs any considerable quantity of indol, even if elaborated. That it does so in a vast majority of adults is no argument that it is normal in the strictest sense of the term.[13] Some light is thrown on this question by estimating the indol which appears in the feces and comparing it with the amount of indican excreted by the kidneys. Baumstark[14] has made such determinations and found that, with one exception, fecal indol was much greater than urinary indican. This occurred in presumably healthy persons and in those suffering from disease.[15] It would seem as if this variability in absorption is the first defence of the organism against the products of intestinal putrefaction. For this reason, if for no other, any method of diagnosticating the presence of enterogenic intoxication by estimating proteid purefactive products in the feces is fallacious.

What has been said of the absorption of indol applies more particularly to that part of the intestinal tract which lies below the ileocecal valve—to that part in which "normal" putrefaction takes place. In admittedly pathological conditions (such as ileus) putrefaction and the formation of indol is very rapid, and the appearance of indican in the urine is prompt and excessive (Ellinger and Prutz[16]). One can hardly refrain from saying that these very differences in absorption contribute in a striking manner to the value of the indican reaction as indicative of intestinal putrefaction, for in that part of the intestine in which indol is most readily absorbed its presence is certainly pathological.

The detoxication of indol—by union with sulphuric acid and potassium subsequent to oxidation—occurs mainly in the liver. Indoxylpotassium sulphate is, of course, indican. Any combination which the liver may make with glycuronic acid instead of sulphuric acid represents a distinct loss to the urinary reaction for indican. This union is not excessive, and probably happens only when the production of sulphuric acid esters is in great excess and the supply of sulphuric acid ions is limited (Schmiedeberg[17]).

Between the intestinal tract and the urine there is a great loss of indol, totaling to from 40 per cent. to 75 per cent. (Jaffé, Wang, Ellinger[18]). What is the fate of this lost indol? Herter and Wakeman[19] found that the "living cells of the body and especially the hepatic and renal cells and the epitheliated cells of the intestinal tract have the power of absorbing considerable quantities of indol, as well as phenol, and tying them loosely in such a way that these bodies cannot be recovered by distillation." The proper interpretation of this phenomenon may lie in two directions. There is a possibility that a certain portion of indol in an organism with vigorous oxidative capacity is disintegrated into primary carbon and nitrogen groupings, to be recombined in other ways or eliminated as simple end products and thus lost.[20] On the other hand, have we here another manifestation of defensive action on the part of the organism in that the cells at large are able to store indol or its derivatives—withdrawing it from circulation—until such time as circumstances and capacity permit of release in detoxicized form? Perhaps both elements play a part. The point of interest is the loss of indol in transit. It seems quite certain that the organism may change this factor within limits at different times.[21]

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[13] One would hardly argue that because 95 per cent. of those people who come to autopsy after the fiftieth year, show evidence of nephritis, that this is a normal condition.

[14] Münch. med. Woch., 1903, 722. Observations on the relation of fecal indol to urinary indican in healthy children would probably solve this problem.

[15] Baumstark's exception was a girl, aged eleven years, suffering from septic peritonitis. It is of interest to note with this that Herter (Jour. Biol. Chem., 1906, ii, 6) in cases of pernicious anemia, made similar comparisons. He found—judging from the table given—that there was no parallel between the two. In both these conditions the intestinal tract is in an abnormal condition. The inference is plain. Furthermore, indol elaborated in the small intestine would be much less liable to reach the feces owing to the fact that the absorptive power of the small intestine for indol is very great even in health.

[16] Zeit. f. Physiol. Chem., 1903, xxxviii, 399.

[17] Arch. f. exp. Path. u. Pharm., 1881, xiv, 288.

That normal bile contains both ethereal sulphates and glycuronates in traces has been noted by Hammarsten. Whether in pathological states this amount can be materially increased, thus delaying or preventing excretion by the kidney, is not known.

We are uninformed as to the capacity of the kidney for the elimination of indican presented to it by the blood stream. In general, renal epithelium takes kindly to sulphur in any form, for even in renal disease the elimination of sulphur parallels that of nitrogen. Sulphates are excreted in the same ratio as urea, until the rate of elimination reaches a certain excessive point when the kidney refuses to maintain the ratio (Cushney).[22] However, this may not apply to ethereal sulphates. If one may reason from analogy, there may be occasions in the course of a nephritis when, by reason of great excess, portions of indican or its precursors are retained in the blood or there may be variations in the rate of excretion. Possibly the regulating mechanism lies further back and the excess is retained or fixed in the body cells until the serum concentration has sufficiently diminished to permit its release. Brain tissue has this power (Herter).

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[18] Jaffe, Virchow's Archiv, 1877, lxx, 78. Wang, Ziet. f. physiol. Chemie, 1899, 27, 557. Ellinger and Gentzer, Hofmeister's Beiträge, 1904, iv, 171.

[19] Jour. Exp. Med., 1899, iv, 307.

[20] The benzene ring is exceedingly refractory to disintegration, and it is broken up by the organism only at the expense of considerable energy. In considering the toxicity of indol or any of its derivitives, this point must be kept in mind, that excessive quantities of indol thrown into the circulation for a long period of time may impair oxidative capacity. It could hardly be claimed, for instance, that one three-finger glass of whiskey is "toxic." However, a man who made a practice of taking three such drinks a day for ten years will present plenty of evidence of it even if considerable carbohydrate has been spared in the process.

[21] Part of this loss may undoubtedly be accounted for by technical difficulties in the recovery of all the indican excreted.

[22] Jour. of Physiol., 1901-02, xxvii, 429.

Jaffé's original estimate[23] of the "normal" excretion of indican for twenty-four hours was based on observations made on eight presumably healthy people. One excreted no indican at all, and one excreted over 19 mg. The average for the eight was 6.6 mg. It was therefore concluded that the normal output was from 5 to 20 mg. per diem. But the difficulty has been to determine just what the word "normal" should signify. If by it is meant "ideally normal," Jaffé is unquestionably wrong—there should be no indican excretion. I am satisfied of the truth of this for two reasons. The urines of heathy children rarely contain appreciable quantities of indican. The same can usually be said of those adults of middle life whose organisms are in good condition and particularly those whose habits as to the use of meat are moderate. Chittenden[24] found during the course of his dietary experiments that the urinary ethereal sulphates gradually disappeared. Fermentative and putrefactive properties of the feces diminished, as "Fletcherizing" subjects naturally ingested less meat, according to observations made by Fisher.[25]

It seems quite possible that the organism might excrete 20 mg. indican daily and not suffer symptoms thereby, provided the oxidative capacity is high and the process does not extend over too long a time. Either of these provisions violated, and the subject will straightway seek a doctor. On the other hand, less than 20 mg. may suggest the source of subjective symptoms if the oxidative capacity is low. In this class of cases the interpretation of the reaction really resolves itself into an inquiry concerning the ability of the patient to detoxicize products of intestinal putrefaction which may be arising at the time.

But if we assume with Jaffé that 20 mg. is about the limit of normal excretion, there is in this a basis for calculation with Obermeyer's reaction,[26] which may be depended upon for clinical purposes;

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[23] Pflüger's Archiv, 1870, iii, 448.

[24] "Physiological Economy in Nutrition."

[25] Trans. of the Conn. Acad. of Arts and Sci., 1907, xiii, 13.

[26] Until very recently Obermeyer's reagent was used for determining quantitative estimations of indican, but it does not yield constant results. There may be as much as 20 per cent. loss (Ellinger, Zeit. f. physiol. Chemie., 1903, xxxviii, 178). This loss is *liable* to be greater with the Jaffé reaction as applied to qualitative work. There is a great temptation to use too much of the oxidizing agent (potassium permanganate, etc.), which further oxidizes and decolorizes the indigo-blue. The agents should be fresh. When the urine, acid, and oxidizing agent are mixed, they should commingle at the same time, after the manner suggested by Emerson, and not as usually done by mixing two and adding a third. After the mixture is made with either reaction, it should be turned against the finger once and allowed to stand for five minutes. Heating to blood heat before adding the chloroform will also assist. According to Ellinger, there is a loss of 10 per cent. even under the most favorable circumstances. If quantitative estimations are desired, it is well to remember that in urines with high indican content, variations in the quantity of oxidizing reagent and chloroform are necessary to insure maximum color. The better method is to dilute the urine with known quantities of water in the presence of an excess.

20 mg. of indican in 1000 c.c. of urine will yield with Obermeyer's reagent, as ordinarily practised in the laboratory, an index of somewhere between 50 and 75 on Folin's scale.[27] An index of 100 or several times that amount is not uncommon. Heeding all factors given above as necessary for the production of such indices, it must be evident that such a symptom and the intoxication it represents is worthy of very serious consideration, particularly if there is any tendency for it to continue, or if it is accompanied by evidences of digestive, hepatic, or renal disease. Perhaps the following will present some working rules until something better is devised:

1. Urinary indican is a product of intestinal putrefaction. There may be putrefaction without the production of indol, but there cannot be indicanuria without putrefaction.
2. A maximum excretion of indican, that is, an amount which on Folin's scale gives an index of 100 or over, may be safely relied upon to indicate excessive intestinal putrefaction, and especially the intoxication arising therefrom.
3. A maximum reaction which gives an index under 100 may be significant, but its interpretation should be strictly guarded by the general condition of the patient, that is, by the oxidizing and excretory capacity.
4. A heavy indican reaction which markedly subsides under treatment undoubtedly indicates a lessening intoxication, but minor variations in the color index have no significance at present.
5. No interpretation can be placed on a negative reaction, too many unsolved factors entering into the problem.

These are the rules which have been followed in my practice for some time, and which I have found very satisfactory. It is conceded that they are not perfect, but they furnish a practical working hypothesis. It must also be stated that in singling out one of many putrefactive products it has been impossible to do other than take a very narrow view of the subject as a whole. There is much more evidence on the condition of which indicanuria is an indication, but it cannot be presented here. Due allowance must be made for these considerations if the principles herein are to be applied to concrete cases in which intoxication arising from intestinal putrefaction is suspected.

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[27] Otto Folin (Amer. Jour. of Physiol., March, 1905), as a matter of convenience, in reporting some urinary examinations, used a scale based on the color of Fehling's solution. A urine which precipitated a color with Obermeyer's reagent equal to Fehling's solution was said to have an indican index of 100. Exact determinations were obtained by diluting either the urine or the Fehling's solution according to the index, whether above or below 100.

THE TREATMENT OF CHRONIC STENOSIS OF THE LARYNX AND TRACHEA.

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In a previous article upon this subject[1] a plan of treatment which seemed capable of success was given in detail, and 23 illustrative cases were described. As enough time had not then elapsed to make the results conclusive, and as now all the patients who were then living have recovered, it seems proper to review the procedures by which success was obtained. In those 23 cases at the time of the last report, there had been 3 deaths and 2 failures to cure; the misfortunes I think were largely dependent upon my inexperience. All of the remaining 18 patients are practically well, and all but one have good or perfect voices. Two, however, of these 18 are still wearing intubation tubes. One of them is a practising physician, who has acquired the somewhat remarkable accomplishment of intubating and extubating himself, and cannot be induced to wear the tube continuously and long enough permanently to cure his cicatrix, which at constantly longer intervals shows signs of recontraction, and from time to time requires some dilatation. The second patient has a cicatrix just below the vocal cords, and though a trial has shown that it will not now shrink enough appreciably to obstruct respiration, it interferes so much with the cords as to permit only whispering speech, to overcome which disability its complete obliteration by pressure is being attempted. With these two exceptions a practically perfect result can be announced for 18 out of the total of 23 patients.

The causes of obstruction in the larynx or trachea may be briefly recapitulated as follows: (1) Obstruction or compression of the respiratory tract by neoplasms, of which the papillomas are the most common, and exuberant granulations rare. (2) Cicatrices of traumatic, operative, or inflammatory origin. (3) Hypertrophic subglottic laryngitis. (4) Atrophy (of disuse) of the laryngeal abductors in "retained tubes" and tracheal cannula cases. (5) Other less common causes of obstruction might be cited, but there is no necessity of multiplying the classification, as the cases must evidently be either entirely irremediable or else possible of treatment by operation or a combination of the operation and subsequent dilatation methods here advocated.

This work was begun with the object of relieving some apparently hopeless cases of retained intubation tubes and tracheal cannulæ which were sequels of diphtheria, and with the experience thus gained was extended to the treatment of the more strictly surgical conditions of fibrous strictures and of neoplasms. Hence this order will be more or less followed below, as it showed the way to overcome many obscure difficulties and dangers.

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[1] Amer. Jour. Med. Sci., November, 1905.

Statistics have demonstrated that about 1 per cent. of the patients intubated for laryngeal diphtheria will subsequently be unable for an indefinite period to breathe without the assistance of the tube or a tracheotomy. As such cases are at the best (or worst) not numerous, and as autopsies are often not obtained, the true pathology of the condition is not generally recognized or is disputed.

In my previous article there were cited in detail 15 cases of "retained tube" following laryngeal diphtheria. In this group there were 3 autopsies, and in addition the larynx and trachea of 5 cases were carefully inspected by thyrotomies and tracheotomies. In these 8 patients the pathological condition was thus verified by sight and touch, and in 3 of them was studied under the microscope and found to be a chronic hypertrophic laryngitis, a combination of an exudative and productive inflammation causing a vascular, œdematous thickening of all the intralaryngeal soft parts sufficient to occlude completely the respiratory tract from the false cords to the lower border of the cricoid cartilage or the first or second ring of the trachea. In the other 7 cases the clinical picture was so similar, as was also the sensation communicated to the operator's hand during intubation, that there can be no reasonable doubt of the chief primary cause of obstruction in these patients, all of whom had to be intubated for laryngeal diphtheria, and thereafter could not breath without the instrument. Ulceration and cicatrices may develop at the same time or later (generally as the result of tracheo-otomy or other operation), but a cicatrix as the original source of obstruction after diphtheria only occurred twice in my cases, and then the diagnosis was doubtful. Exuberant granulations as a cause of obstruction occurred but once in the postdiphtheritic cases, and then were secondary to an intubation for hypertrophic laryngitis. Spasm or cramp of the adductors simulating an hypertrophic laryngitis occurred three times.

In considering the reasons for the stenosis in these retained tube cases following diphtheria the above experience may be considered a fair example of the average: hypertrophic laryngitis, spasm of the adductors, cicatrices, and exuberant granulations occur in about this order of frequency; the difficulty in the great majority of cases is, however, a chronic exudative and productive inflammation of the intralaryngeal soft parts; in other words, a chronic hypertrophic subglottic laryngitis. The condition was recognized long before the invention of intubation, when tracheotomy was the only remedy possible for severe croup, and hence it is not fair to ascribe it to faulty technique in the "tubage." The chronic thickening may have something to do with traumatism inherent in wearing a tube, but the individual operator should not be held responsible for what is properly a danger inseparable from a life-saving procedure; and this danger is comparatively slight when one considers that it only occurs in about 1 per cent of the cases.

What I have called "adductor spasm" as a cause of stenosis is not generally recognized, but is a condition of serious moment in patients who have worn a tube for a long period of time. This instrument, particularly the "special" tube recommended below, places the abductors or openers of the larynx entirely at rest for weeks or months, while with every effort in coughing or clearing the throat the adductors are brought into use; thus one set of muscles, the closeers of the larynx, should, theroetically at least, hypertrophy, and the other set, or openers, atrophy. I have never been able to verify the condition by autopsy, but the treatment necessary to overcome it corresponds so exactly with the hypothesis that I have no doubt of the accuracy of the description, and unless it is borne in mind some of these cases will be given up as hopeless instances of intralaryngeal hypertrophy or abductor paralysis, or what not, and condemned to a permanent tracheotomy. Localized obstructing paralysis may be possible, but from a study of the literature and from observation in a considerable experience I believe it must be extremely rare.

The differential diagnosis of the causes which may necessitate the retention of an intubation tube (or a tracheal cannula) after laryngeal diphtheria for weeks or months is not difficult. The common hypertrophic laryngitis usually produces complete obstruction, which is manifest immediately or very rapidly after the removal of the artificial aid to respiration. A cicatrix, on the other hand, does not immediately occlude the lumen of the passage when the dilating instrument is removed, but it contracts gradually in the course of days; and more distinctive still is its resistance to instrumentation. The soft œdematous tissues of an hypertrophic laryngitis require no force in the passage of the proper sized tube or urethral sound, while for the introduction of an instrument through a fibrous structure some pressure has to be exerted. Furthermore, the frequently dangerous accident of auto-extubation, especially when it occurs repeatedly and without apparent provocation, generally accompanies hypertrophic laryngitis, and seems to be largely caused by it. It often occurs in the presence of both hypertrophic and cicatricial stenosis, but very rarely when the condition is purely cicatricial.

During the manipulations exuberant granulations, which are very seldom the true cause of the obstruction, should be seen or felt; they can be generally found around a tracheal fistula or at the upper or lower end of a tube or cannula, and should reveal their presence by difficulty in inspiration rather than expiration or in the reverse state of affairs. They are friable and bleed easily, and if ordinary care is employed cannot readily be overlooked.

The condition of adductor spasm occurs only in those patients who have worn a tube, or much less commonly a cannula, for weeks or months, and so closely simulates hypertrophic laryngitis in the immediate and complete obstruction as to be indistinguishable from it without the aid of general anesthesia. Then, when consciousness and the pharyngeal reflexes are abolished, the stenosis, which previously had been complete, will be found to have disappeared and natural respiration will be evident. Occasionally the spasm will not appear for several hours or days after extubation or removal of the cannula, and then will occur suddenly with a stridulous inspiration following a cough or some excitement or slight exertion. There is apparently a lack of coördinate control as well as an overabundance of strength in one group of muscles and a diminished strength in the abductors. The only way of rectifying the possibly fatal discrepancy is to build up the strength of the openers of the larynx and to allow the patient time and opportunity to regain control of them and become conscious of that power.

The principle which I have found successful in the treatment of hypertrophic laryngitis and in cicatrices of the upper part of the respiratory tract involves only long continued and constant dilatation, which stretches the contracted tissues to the utmost limit they will bear without sloughing and up to the largest normal caliber of the passage in question, and so overcomes the obstruction by producing a permanent pressure atrophy in the affected parts. A few of the less severe cases of retained tube due to hypertrophic laryngitis after diphtheria will recover under the application of astringents or the use of a tube as small as can be safely worn, with the object of minimizing traumatism; occasionally tracheotomy has been reported as intentionally or accidentally succeeding in the same way. But unless there is some distinct indication for the operation, such as dangerous auto-extubation, it seems hardly justifiable to add to the already bad enough condition the probabilities of a cicatrix or tracheal deformity which so often follows the long continued use of the curved cannula. And when it is remembered that hypertrophic laryngitis was a not uncommon cause of obstruction after long retention of the cannula in the pre-intubation days, one should hesitate still more at the infliction of such additional risks.

To accomplish the continued dilatation and consequent pressure atrophy necessary to overcome the obstruction of either a hypertrophic laryngitis or a cicatrix a properly made O'Dwyer intubation tube is almost a perfect instrument. It can be worn without harm to the patient for months or years, and I have observed such patients with the tubes in place to pass successfully through measles, pneumonia, typhoid fever, and even whooping-cough; indeed it does not seem appreciably to increase the gravity of the prognosis of these affections. The tube, as is well known, possesses a head which rests on and in the aryteno-epiglotic folds, a neck constricted from side to side to fit between the vocal cords within the glottis, and below a retaining swell which expands to occupy the space at and below the cricoid cartilage. The lower end in the children's sizes is made longer than in those used for adults, as it was designed to extend well beyond the false membrane of a laryngeal diphtheria. The tip is again constricted from side to side to pass easily through the glottis. The "normal" tubes were designed by Dr. O'Dwyer from casts and measurements to fit somewhat loosely the average larynx and exert the least possible pressure upon acutely inflamed tissues compatible with retention of the instrument. When this stage of the disease has passed and been succeeded by a chronic thickening or a cicatrix, the tube, to obtain the pressure necessary to produce an atrophy of the abnormal thickening, must be modified into a "special" instrument for each case. That is, with the patient under deep general anesthesia, a number of normal tubes are passed through the larynx until one is found in which the retaining swell distends the constriction to the limit the operator believes it will bear without sloughing. If the difficulty is dependent solely upon a soft hypertorphy, the diameter of the retaining swell will be regulated largely by the diameter of the passage within the cricoid cartilage. Inasmuch, however, as the retaining swell lies, when the tube is in place, just below this point, where the trachea is capable of considerable distention without damage, quite a little force in the test-tubage is permissible. Having thus ascertained the largest possible diameter of the larnyx a "special" tube is made of the length of the normal tube suitable for the age and development of the patient, but with a retaining swell having the same diameter as that of the trial tube. The neck of this "special" tube, however, to exert pressure upon the hypertrophied intralaryngeal tissues, should be as large as possible, but its transverse diameter must be $\frac{3}{32}$ of an inch smaller than the retaining swell, or it will certainly be coughed out. Also the head must have a diameter $\frac{6}{32}$ of an inch greater than the retaining swell to prevent the instrument from slipping within the larynx. These measurements apply to the ordinary hard rubber tube, but when the heavier metal tube is employed the diameter of the head should exceed that of the retaining swell by $\frac{7}{32}$ or even $\frac{8}{32}$ of an inch, especially for adults. For very small children these measurements can be changed from thirty-seconds to sixty-fourths of an inch. It must be borne in mind that a difference of $\frac{3}{32}$ of an inch in the transverse diameters of the neck and retaining swell is the very least which experience has demonstrated is sufficient to keep the tube in place, and many patients will require a tube with the neck $\frac{4}{32}$ or even $\frac{5}{32}$ of an inch less in diameter than the retaining swell. Only a trial will show what is necessary. But the neck of the special tube must be considerably larger than that of the normal, or a failure to cure will probably result.

When auto-extubation complicates the difficulties, and it may be a very dangerous complication if assistance is not constantly and immediately available, tracheotomy is almost always necessary. Some patients with hypertrophic laryngitis will cough up any tube which can be inserted, and, unless it is quickly replaced, will strangle. Under these circumstances it is generally essential to provide an opening in the trachea, though there can be no expectation of thus accomplishing a cure of the stenosis. Indeed, it will probably only add a cicatrix or a deformity in the shape of an obstructing "spur" in the posterior wall of the trachea if the cannula is worn long enough. The operation should be performed carefully in the median line well below the cricoid cartilage, under full anesthesia, with the tube in place. At the same time opportunity is thus given to obtain the necessary measurements for making what I have described as a "plugged" or "clamped tube." This is a "special" intubation tube with the neck (or lower end if there is a cicatrix low down) enlarged to exert pressure upon the stenosing area. The "clamp" or "plug" portion of the tube is a removable attachment designed to fasten to the tube at right angles through the tracheal fistula after the tube is inserted, and thus prevent its displacement. The larger tubes will support a "plug" or a cylindrical piece of hard rubber, which is long enough so that when in place its outer end extends through the fistula about an inch beyond the surface of the neck, to allow easy manipulation, and its inner end, perforated to correspond to the lumen of the intubation tube, screws into a hole in the anterior wall of the intubation tube. The "clamp" is employed for smaller instruments, and is made, like a pair of obstetrical forceps, of two little silver blades, which are passed through the fistula into grooves on the sides of the tube and held there by a "collar" screwed down around the shanks.

Of these two attachments, the plug is probably better for large or for metal tubes, and the clamp for smaller instruments and those made of rubber. The clamp is also better in that it can be made small enough not to press apart appreciably the severed anterior segments of the trachea, and thus, by preventing contraction in the soft posterior wall, there will not be so much danger of narrowing the caliber of the passage when the instrument is removed. A tube with either of these attachments cannot be coughed out, and can be worn for an indefinite period without harm, and in all respects is infinitely better than the ordinary cannula. If, therefore, a patient with a hypertrophic or cicatricial stenosis of the upper air passage has to be tracheotomized, one of these instruments should be inserted as soon afterward as it can be obtained, and continued in place as advised for the usual special tube. Neither a plugged nor a clamped tube should, however, be employed unless there is some good reason for it, as the tracheal fistula gradually, of course, becomes permanent and presents its own difficulties, although these may be offset by the ease with which after removal of the tube any adductor spasm can be met.

The usual intubation tube is made of vulcanized rubber, which is an ideal material, as I have never known it to clog and it is practically indestructible. It does, however, have to be removed and cleaned about once in a month or six weeks, as the head generally becomes foul, and this decomposing matter might cause sepsis or possibly obstruct the lumen. But occasionally in cases of hypertrophic laryngitis the special rubber instrument, even after months of continuous use, will seem to produce no improvement. Then by changing to a similarly made metal tube the desired result will generally be obtained. I am unable to explain this except that the metal tube is heavier and so may exert more pressure; or there may be some electrolytic effect, as it is constructed of bronze or brass heavily plated with gold, and so consists of at least two metals which are in contact with moisture. Whatever reason may be given, the metal tube will often succeed when the rubber has seemed to fail, but the latter should always be tried first, as in the average case it is sufficient and safer. The metal tube soon becomes rough with a presumably calcareous deposit, which catches the secretions, and in at least one of my cases thus produced asphyxia. After wearing such an instrument, preferably of hard rubber, for months, it is very necessary to consider the adductor spasm both for diagnosis and treatment. When a cure ought to have been obtained the conditions may seem entirely unchanged, and the true state of affairs can only be ascertained by general anesthesia. Under ether, then, about once in every three or four months the tube should be carefully removed and the respiration observed. If it is still completely or partially obstructed, the dilatation must be resumed. But if the breathing is natural and easy, then spasm may be confidently diagnosticated, especially if in the first effort at coughing, as consciousness comes back, the dyspnœa recurs. To overcome this there must be inserted for several days or weeks a tube with a head and retaining swell and length like the previously worn dilating instrument, but with a neck as small as possible, in order that motion to some extent can occur in the openers of the larynx. If the dyspnœa makes its appearance slowly during the course of hours or days, it is not due to adductor spasm, and there is no escape from the previous treatment. When enough time, or some one or two months have passed with the very small necked tube in the larynx, and the faulty muscles may be considered to have regained their strength and the patient his power to innervate them, the small tube is removed under ether and a little morphine is administered to allay spasm and nervousness. For the first few hours, however, the attendant and the patient will suffer much anxiety, as frequent attacks of stridulous inspiration and more or less dyspnœa will occur during the readjustment to new conditions. But with patience and the assistance of antispasmodics a day or two will suffice to overcome all such difficulties.

A fibrous stricture is managed in exactly the same way, with the exception of the primary dilatation in case the stenosis is too tight to admit a tube. Under these conditions there is already a tracheal fistula, or one is urgently needed, and through this under general anesthesia urethral sounds are passed up and down until considerable resistance is encountered. Then measurements are taken upon an ordinary tube and a "special" one is constructed having its specially enlarged part placed to correspond with the location of the stricture and with regard to the normal diameter of the air passage, which is capable of much stretching without damage except within the cricoid ring. When the latter has been cut in a hasty previous operation there seems to be little danger of sloughing under almost any reasonable pressure, but if it is intact, such an accident is conceivable, and actually occurred in a case cited by Dr. O'Dwyer. Sometimes in very dense strictures a small tube can be inserted for a week or two, and afterward a larger size. But no stricture should be considered hopeless provided any trace of mucous membrane remains, as I have had experience in at least one such case in which the passage through the larynx had to be opened by a careful dissection very much like an impermeable stricture of the urethra. A small tube was then inserted and the wound partially closed, and later larger instruments were employed, and eventually an almost perfect result was obtained.

As regards the prognosis and duration of treatment in patients with hypertrophic laryngitis or cicatricial stenosis, the statistics of the 23 cases previously reported furnish much information. One case of hypertrophic laryngitis (Case I), the only one in the series which seemed to have occurred spontaneously and without a previous diphtheria, recovered permanently at the end of about four weeks of dilating tubage. Another of cicatricial stenosis (Case XXIII of Dr. Simpson's, previously reported as a failure) required forty-nine months, or a little over four years, of continuous intubation, and during the latter two of these four years the tube was not once removed from the larynx. It has now been out for over six months, and there is no sign of recontraction and the voice is returning. Cases X, XII, and XIII, the most discouraging of the series of instances of hypertrophic laryngitis complicated by cicatrices due to tracheotomies and explorations through the thyroid cartilage, required respectively about six, three, and five years of dilating tubage to effect a cure, which now may be considered permanent, as they have remained for nearly two years without any sign of difficulty and all have good voices. Cases X and XIII would have recovered sooner if I had had less impatience and more experience, for as soon as they seemed well their tubes were removed, with the result that the cicatrices recontracted. A fibrous stricture apparently requires at least two years of continuous dilatation to the utmost limit of the normal lumen of the respiratory tract before it can be considered as permanently overcome. Even then it may gradually reappear, and if it does another six months or a year of continuous tubage must be endured, but there is a reasonable certainty, as proved by experience, of thus gaining an ultimate cure. Cases of hypertrophic laryngitis are slow and troublesome enough, but once well do not recur like a cicatrix. Case XII, one of hypertrophy, had to wear a dilating tube from February, 1904, until March, 1906, and then, owing to adductor spasm, a small tube until the following June, and thus required a little over two years of treatment, which seems to be about the average.

Nothing has been said about the treatment of obturating or compressing neoplasms, as these, if not inoperable, always require removal, and a discussion of the surgery of the air passages does not come within the scope of this article. But a few words about the so-called "exuberant" granulations, which are largely a myth, and about the common papillomas are not out of place. Granulations may, indeed, though rarely, produce obstruction by growing around some source of irritation, like the upper or lower end of a tube, or into the fenestrum on the convexity of a cannula, and then must be cut or scraped away and their recurrence prevented by removal of the cause, which generally means enlarging and rounding off the head of the tube or shortening and smoothing its inferior extremity. The cannula should be replaced by a well-fitting tube. Some means, at any rate, can be always found of doing away with the localized pressure upon an ulcer.

Statistics in cases of multiple papillomas seem to favor tracheotomy and a policy of waiting for an indefinite period, but many surgeons favor one or more attempts at radical removal by an open operation as soon as there are evidences of obstruction, and if the excision could be done thoroughly it would probably be more often advocated. The chief difficulty lies in the abundant capillary oozing and the inaccessibility of the upper part of the larynx and deeper portion of the trachea. To reach these regions the hyoid bone must be divided as well as the thyroid and cricoid cartilages and the trachea possibly down to the episternal notch. To allay the irritability and cough and to check the oozing of blood there is nothing better than a 1 per cent. solution of cocaine and the ordinary 1 to 1000 solution of adrenalin, which can be swabbed freely over the exposed mucous membrane. Then, under a good light and wide retraction of the wound, the base of the fungating masses can be trimmed out with curved scissors well into sound tissue. By inserting one finger through the mouth all of the upper parts of the larynx can be pressed down into sight and treated in the same manner, giving particular attention to the natural folds just above the cords. Then at the end of the operation I have been accustomed to insert a full sized special intubation tube somewhat more cylindrical than the ordinary kind, and with a larger head to insure against the possibility of its slipping down into the weakened larynx. Over it the wound is closed with two tiers of catgut sutures, and drainage by a few strands of the same material is inserted at the upper and the lower angles. The instrument used in this way prevents appreciable subsequent hemorrhage by its pressure, avoids the danger of œdema and stenosis, and hastens a restoration to the normal. In a conconsiderable experience I have never noted any ill effects. The only risk seems to be that of auto-extubation followed by swelling, which should not occur before the tube could be reinserted or the trachea opened. No infection of any moment has occurred in my cases, although those treated in this manner do not include extensive resections of portions of the whole wall of the trachea or larynx, which, of course, opens the deep cellular spaces of the neck. But even then there are many instances when with proper drainage the wound in the respiratory tract can be closed with advantage over a suitable tube.

THE REACTION OF THE PHAGOCYTES OF ELEPHANT'S BLOOD ON THE BACILLI OF TUBERCULOSIS

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In casting about for an animal whose blood might be availed of in conducting experiments on immunity against tuberculosis, it occurred to me that the elephant possessed two characteristics which might make it useful for this purpose: First, its remarkable longevity, suggesting a power of resistance to all infections, whether of human beings or of the lower animals; and second, the fact that no records could be found of the observation of tuberculosis in this race.

With the skilful coöperation of Dr. Herbert Fox, chemist of the Laboratories of the State Department of Health, the following observations were undertaken. By the courteous permission of the Zoological Society of Philadelphia, a small quantity of blood was obtained from an elephant's tail. At the same time experiments were made with the blood of the human being, the cow, and the guinea-pig. The conditions in each case were identical. The leukocytes were twice washed and the emulsion of tubercle bacilli was prepared by washing lightly with alcohol and ether and rubbing up in a mortar in 0.86 per cent. salt solution and then treating with the centrifuge. The turbidity of the emulsion corresponded to No. 2 of a barium sulphate nephelometer (Table I). A second experiment was made in which the emulsion was produced by boiling in chloroform, the object being to get a suspension which will keep indefinitely and may always be rendered homogeneous by shaking.

Four salt solutions of different strengths were used for the purpose of testing spontaneous phagocytosis.

TABLE I.—COMPARATIVE PHAGOCYTOSIS OF HUMAN, BOVINE, AND RODENT BLOOD WITH BACILLUS TUBERCULOSIS.

	Phagocytic Index.	Average.
0.1 c.c. elephant's serum plus 0.1 c.c. elephant's leukocytes plus 2 c.c. bacteria emulsion	1.0	0.40
0.1 c.c. elephant's serum plus 0.1 c.c. guinea-pig's leukocytes plus 2 c.c. bacteria emulsion	0.7	0.28
0.1 c.c. elephant's serum plus 0.1 c.c. emulsion human leukocytes plus 2 c.c. bacteria emulsion	0.4	0.16
0.1 c.c. elephant's serum plus 0.1 c.c. emulsion cow's leukocytes plus 2 c.c. bacteria emulsion	0.3	0.12
0.1 c.c. cow's serum plus 0.1 c.c. emulsion cow's leukocytes plus 2 c.c. bacteria emulsion	1.0	0.28
0.1 c.c. cow's serum plus 0.1 c.c. emulsion human leukocytes plus 2 c.c. bacteria emulsion	0.57	0.16
0.1 c.c. cow's serum plus 0.1 c.c. elephant's leukocytes emulsion plus 2 c.c. bacteria emulsion	0.43	0.12
0.1 c.c. cow's serum plus 0.1 c.c. emulsion guinea-pig's leukocytes plus 2 c.c. bacteria emulsion	0.43	0.12
0.1 c.c. human serum plus 0.1 c.c. human leukocytes plus 2 c.c. bacteria emulsion	1.0	0.24
0.1 c.c human serum plus 0.1 c.c. emulsion cow's leukocytes plus 2 c.c. bacteria emulsion	0.83	0.20
0.1 c.c. human serum plus 0.1 c.c. emulsion elephant's leukocytes plus 2 c.c. bacteria emulsion	0.5	0.12
0.1 c.c. human serum plus 0.1 c.c. guinea-pig's leukocytes plus 2 c.c. bacteria emulsion	0.33	0.08
0.1 c.c. guinea-pig's serum plus 0.1 c.c. guinea-pig's leukocytes plus 2 c.c. bacteria emulsion	1.0	0.28
0.1 c.c. guinea-pig's serum plus 0.1 c.c. emulsion human leukocytes plus 2 c.c. bacteria emulsion	0.85	0.24
0.1 c.c. guinea-pig's serum plus 0.1 c.c. emulsion elephant's leukocytes plus 2 c.c. bacteria emulsion	0.57	0.16
0.1 c.c. guinea-pig's serum plus 0.1 c.c. cow's leukocytes emulsion plus 2 c.c. bacteria emulsion	0.4	0.12

One half hour at 37° C. 100 cells counted.

TABLE II.—AVERAGE PHAGOCYTOSIS OF HUMAN AND ELEPHANT'S BLOOD WITH BACILLUS TUBERCULOSIS.

Emulsion made in NaCl solution of	Human. March 29, 1907	Human. March 30.	Human. April 1.	Human. April 2.	Elephant. April 2.
0.1 per cent.	0.46	0.42	0.28	0.30	0.36
0.6 per cent.	0.36	0.28	0.30	0.34	0.34
0.86 per cent.	0.28	0.32	0.24	0.32	0.48
1.5 per cent.	0.32	0.40	0.44	0.38	0.46

In both experiments the blood of the same individual was used, the bacteria for the different emulsions were obtained from the same tuberculous strain, and the turbidity was identical. In the second the whole blood method was employed, using homologous cells and serum. Table II shows the phagocytic capacity of the blood of the same person on four successive days, the last time on that of the second elephant test.

The results of these experiments may be summed up as follows:

1. The expectation that the leukocytes of elephants' blood might possess a high degree of phagocytic energy as far as the tubercle bacilli is concerned was not fulfilled to such a degree as to promise any practical result, being but a trifle higher than that of human cells.

2. The highest phagocytic average is obtained when the leukocytes and cells of the same animal or race are employed.

3. When the serum of the various animals is mixed with the leukocytes of other animals, the results vary very much, in accordance with the order in which the mixture is made. For example, when elephant serum is added to guinea-pig leukocytes, the index resulting is only 0.7, but if the guinea-pig serum is added to elephant's leukocytes, the index mounts to 0.85. If bovine serum is added to human leukocytes, we obtain an index of 0.57, but if human serum is mixed with bovine leukocytes, it reaches 0.83.

4. It seems to make very little difference numerically in the phagocytosis of tubercle bacilli whether they are emulsified by rubbing in a mortar with salt solution or by boiling in chloroform.

REVIEWS.

THE OPERATIONS OF SURGERY. BY W. H. A. JACOBSON and R. P. ROWLANDS. Fifth edition; 2 volumes; pp. 926, 1139; 776 illustrations. Philadelphia: P. Blakiston's Son & Co., 1908.

WE have never understood why Mr. Jacobson should insist—as he has always insisted—that his admirable treatise on operative surgery is "intended especially for the use of those recently appointed on a hospital staff and for those preparing for the higher examinations," and "*not* for those with a large surgical experience." There has been no time, during the two decades that have elapsed since its first appearance, when it was not potentially useful to any surgeon, however large his experience, who realized that he had yet something to learn. No other book on the same subject discussed so thoroughly the facts bearing upon what is, after all, fundamental for operators, the decision whether to operate or not, or has given, to aid them in any particular instance, so many illustrative cases from both the personal experience of the author and surgical literature. Very few have excelled it in the recital of operative details. It remains now, in 1908, as it began, in 1888, one of the most satisfactory books that a surgeon can turn to if he desires a broad and comprehensive view of an operative procedure, including some consideration of the precedent and attendant circumstances and the probable result. No other foreign book has, during the same twenty years, so continuously demonstrated entire familiarity on the part of its author with the surgical work that was being done in this country, or has so consistently set forth the results of that work, as have the successive editions of Mr. Jacobson's *Operations of Surgery*.

It has been so frequently and so thoroughly reviewed as to its general teachings, that the chief interest attaching to this edition lies in the present views of the authors as to operations or methods introduced, or popularized, or more widely adopted and extended, or distinctly modified during the last four years, that is, since the appearance of the last previous edition.

Reading it with this idea in mind, the following matters—taken almost at haphazard, to serve as examples—seem worthy of note:

Tendon transplantation is carefully reviewed, the favorable opinions of Tubby and Jones are contrasted with the less favorable ones of Keetley and Clarke, and the remark of Montgomery (as to the operation in cases of infantile paralysis), "The more complex, the more indirect, the more ingenious the method, the worse the result; the directer, the simpler, the more obvious, the better," is quoted with approval. The authors add: "From America, where every fresh operation is at once tested largely and with much zest, we have warnings not to expect too much from tendon transplantation in infantile paralysis."

In amputation at the elbow joint the possible advantages of Miller's modification of the circular method (heretofore thought to be inapplicable because the cicatrix is apt to be central and adherent) are fully set forth.

As to the treatment of combined shock and collapse, a most useful comparison of the various methods of infusion and transfusion (founded on the recent work of Beddard) has been added, and their relative advantages and disadvantages are clearly stated; and later, the prevention of shock by the preliminary cocainization of large nerve trunks (Crile and Cushing) is adequately discussed. The work of Barrows and Bauer in the intravenous injection of antiseptics in sepsis is also summarized.

In noting the fact that excision of the shoulder joint is rarely performed because of the comparative infrequency of diseases of that joint, especially of tuberculous disease, which require operative measures, the further explanation might have been added that the diseases produced by trauma to the shoulder are relatively infrequent in this joint because of its ample covering of muscles which protect it from effects of cold and damp; the mobility of the scapular segment of the shoulder girdle lessens greatly the effect of traumatisms; the laxity of its capsular and synovial elements, which, though it favors luxation, permits a moderate effusion to occur without harmful tension; the influence of the weight of the upper extremity in the usual position of the body in resisting, by gravity, the destructive pressure of joint surfaces against each other, caused by muscular spasm after injury or during disease; and the ease with which the joint may be immobilized without irksome confinement of the patient (Piersol).

As to the light treatment of lupus, while recognizing fully the vast improvement it brings about in both the ulcers and the co-existent scars, the authors think that we are now only beginning to be in a position to estimate its real "curative" value. They think that many cases of "cures" are valueless because they have been imperfectly or prematurely reported, and remind their readers of the well-known dictum of Verneuil, that operations on the tuberculous abound in "half successes, incomplete results, and unfinished cures."

The subcutaneous injection of sterilized paraffin for the correction of deformities is described, and Mr. Stephen Paget's excellent results are alluded to, but the extravagance of some of the claims, in reference to the method, and the possibility of late suppuration, are properly mentioned.

Kocher's abandonment of the submaxillary operation for removal of the tongue and adoption of "Syme's operation" (with division of the symphysis menti) are discussed, with approval as applied to cases in which a growth has extended toward the hyoid. In other cases, Mr. Jacobson's original preference for the Whitehead operation remains unchanged.

As to the important question of the period of freedom from recurrence, after the removal of a cancerous breast, which justifies the statement that the patient is "cured," he does not mince matters, but says: "I look upon Volkmann's teaching as most pernicious, and on the adoption of his teaching—that if patients remain free for three years after an operation for malignant disease, they may be looked upon as cured—as alike unscientific and dishonest, and unworthy of our profession." Most surgeons who are more occupied with observing facts than with making statistics will agree with him. He rightly thinks that when the supraclavicular glands are involved in such cases the condition is hopeless so far as radical cure is concerned, and believes it is analogous to that found in cancer of the tongue, when the glands of the neck are involved, quoting Mikulicz in support of this opinion. The whole article on the removal of the breast is one of the soundest and most instructive in the book.

For the radical cure of femoral hernia, he thinks Lotheissen's operation (the essential part of which is the closure of the *upper end* of the femoral canal by joining the lower margins of the internal oblique and transversalis to Cooper's ligament) is the most anatomically ideal, and is, therefore, destined to become the operation of the future.

The surgical treatment of Bright's disease by Harrison's method (renipuncture, capsulotomy, or nephrotomy), or by Edebohls' "renal decapsulation," is considered from both the theoretical and the statistical standpoint. He concludes that: "Published facts do not lead us to hope for favorable results, from surgical interference in Bright's disease," and that "experimental evidence lends but little if any support to the advocates of this operation, and it fails to demonstrate any real anatomical reason for its supposed success. The literature of the subject is full of vagueness, inaccuracy, and confusion."

The sections on operations on the ureter, retroperitoneal hernia, appendicitis, gastrojejunostomy, castration and vasectomy, prostatectomy, prolapsus ani, excision of the rectum, aneurysm, ectopia vesicæ and epispadias, and many others, have been recast or so largely added to as to make them almost new articles; they tempt to quotation, but space does not permit.

In every one of those mentioned, and, indeed, throughout the book, the recent writings and methods of American surgeons are not merely fully described, but often constitute the chief material that has been added; and many of the illustrative cases and no inconsiderable number of the cuts are abstracted or redrawn (always with full credit) from the pages of American journals.

This edition is at once evidence of the continued industry, scholarship, and sound judgment of its authors, and a tribute to the value of the surgical thought and accomplishment of our country at the present day. J. W. W.

A System of Medicine. By Many Writers. Edited by Thomas Clifford Allbutt, M.D., LL.D., F.R.C.P., F.R.S., Regius Professor of Physic in the University of Cambridge; and Humphry Davy Rolleston, M.D., F.R.C.P., Physician to St. George's Hospital, London. Vol. II, Part I, pp. 1087; Part II, pp. 1055. London: Macmillan & Co.; New York: The Macmillan Company, 1906.

The original Vol II of Allbutt's *System of Medicine* is issued in the revised edition in two parts, both of which, however, are as large as the original single volume. Part I is devoted to sundry infectious diseases, and Part II to tropical diseases and animal parasitic infections. The opening article is an exhaustive account (198 pages), by James Ritchie, of the general pathology of infection—in part a revision of an earlier article by the late Professor Kanthack, but in greater part entirely new. It is one of the most complete and satisfying articles on the subject extant—a credit alike to the author and the *System* of which it forms a part. Then follows a discussion of certain infective diseases of established bacteriology: Glanders and farcy, by G. Sims Woodhead; anthrax, by John H. Bell and Thomas M. Legge; tuberculosis, by Sidney Martin and W. C. Bosanquet—a valuable summary of the general pathology, modes of infection, spread of the disease in the body after infection, sources of infection, immunity, etc.; the pathology of streptothrix infections, by A. G. R. Foulerton, comprising among other important matters a discussion of the relationship of Bacillus tuberculosis to the acid-fast streptothrichæ, to which botanical group the author is inclined to believe Bacillus tuberculosis belongs; actinomycosis, by T. D. Acland; and syphilis, by Jonathan Hutchinson.

An excellent section on infective diseases of doubtful nature is contributed as follows: Measles, German measles, infectious coryza, and glandular fever, by Dawson Williams; scarlet fever, by F. Foord Caiger and L. S. Dudgeon; chicken-pox and smallpox, by John MacCombie; typhus fever, by Sir John Moore; whooping-cough and mumps, by Eustace Smith; rheumatic fever, by Sir William Church and W. Bulloch; and acute rheumatism in childhood, by W. B. Cheadle. All of the articles are fully abreast of current knowledge and help materially to maintain the reputations of the respective authors. Thus, Dr. Caiger believes that the discharges from the mouth, nose, and ear in scarlet fever are much more infectious than the desquamating epithelium; Dawson, in a new article on infectious coryza, discusses the bacteriology of a common cold and although he refers to Micrococcus catarrhalis, he is inclined to believe that much the same symptoms may be provoked by different organisms; W. Bulloch discusses the supposed relationship of certain microorganisms to rheumatic fever, but though inclined to the general belief that the disease is an infection, he states that the specific bacterial factor is not known. Vaccinia in man is discussed by T. D. Acland—a contribution worthy of the author and food for reflection by our antivaccination friends; the pathology of vaccinia, by Monckton Copeman; vaccination as a branch of preventive medicine, by John C. McVail; foot-and-mouth disease, by Sir John McFadyean; hydrophobia, by G. Sims Woodhead; and the co-exisence of infectious disease, by F. Foord Caiger.

The final section of the book is devoted to intoxications: Food poisoning, by H. Batty Shaw; grain poisoning, and opium and other intoxicants, by T. Clifford Allbutt and W. E. Dixon; alcoholism, by H. D. Rolleston; and metallic and other poisons, including poisonous trades, by T. Oliver. Dr. Shaw makes the interesting and important suggestion that ptomaine poisoning as such is a very restricted possibility, and that the symptoms following the ingestion of tainted food are due to pathogenetic organisms that were present before death in the animal from which the food was obtained, or that have gained access to the food subsequently. The articles by Professors Allbutt and Dixon are such that most of us will want to read them.

Part II of Volume II, as now issued, is a complete treatise on tropical diseases. Some of the articles were contributed to the former edition; these have been revised and removed from their former position, but the majority are new. In order to provide an authoritative account of the animal parasites and carriers of tropical diseases, special articles by zoölogists have been included: Protozoa, by E. A. Minchin; mosquitoes by F. V. Theobald; blood-sucking and other flies known or likely to be concerned in the spread of disease, by Ernest E. Austin; and ticks, by R. I. Pocock. These, comprising over 200 pages, form an exceedingly valuable addition to the book. The long list of tropical diseases is admirably treated by acknowledged authorities. The final section of the volume is devoted to an excellent discussion of animal parasitic infections.

The two volumes form a noteworthy addition to contemporary medical literature; they are almost indispensable to physicians who would keep abreast of the progress of medical science. A. K.

Handbook of Cutaneous Therapeutics. By W. A. Hardaway, M.D., LL.D., Professor of Diseases of the Skin and Syphilis in the Washington University, St. Louis, and Joseph Grindon, Ph.B., M.D., Professor of Clinical Dermatology and Syphilis in the Washington University, St. Louis. Pp. 606. Philadelphia and New York: Lea Brothers & Co., 1907.

It may not be known to every reader that Professor Hardaway published a *Manual of Skin Diseases* some years ago, which was an eminently useful and practical little work replete with originality. We are gratified, therefore, to learn that in association with Professor Grindon, also favorably known as an author, he has conjointly given his pen to the book before us, just published. It is built upon lines that are eminently practical, brief descriptions of the diseases viewed from the clinical standpoint, followed by sufficiently extended remarks upon the treatment, together with abundant formulas, being given. It is intended for the general physician and not for the specialist. Common-sense views and broad ideas, clothed in language that is straight and unequivocal, characterize the substance and style. There is no ambiguity, no disposition to straddle the question and thus occupy non-committal or neutral ground, as authors too often are wont to do. Doubtful questions and problems are frankly met and courageously disposed of, sometimes perhaps rather too briefly, but the volume, it is to be remembered, is a handbook and not a treatise. The nomenclature is sound, with a distinctive tendency to the leading American and English lines of thought. The classification of the diseases is also considered in the same vein. The formulas (of which there are a large number) are written in Latin. We are pleased to note that the English weights and measures are strictly adhered to throughout the pages, which for American and English readers renders the formulas readily workable and easy to to remember. Some excellent recent books have been overweighted with the combination of the English and the Continental weights and measures, to be accounted for possibly by a desire on the part of the author to have his book considered "advanced."

A relatively lengthy chapter is devoted to general treatment and methods, and here may be observed the large experience and conservatism of the authors, as well as the enunciation in a concise practical form of the application of the principles of therapeutics. This is much the most interesting and valuable chapter in the book. The remarks on the use of the Röntgen-rays are sufficiently full, and are conservative, as they should be. The very few words devoted to radium would indicate extra conservatism. More, we think, might safely have been said as to this therapeutic agent and its value in selected cases. Occasionally in formulas one notes the employment of a proprietary remedy, which is to be regretted; the less the student and practitioner hear of secret formulas the better.

The authors of all countries are drawn upon and liberally quoted, but the references are seldom given, doubtless for want of space. As already observed, the tenor of the train of thought throughout is distinctly and almost exclusively clinical, the subjects of etiology, pathology, and pathological anatomy being only lightly or not at all touched upon. The lack of information of this kind is in some instances noticeable. Thus, in considering impetigo contagiosa, the presence in the lesions of the streptococcus is not mentioned. Reference, moreover, might also have been made to the fact that the lesions in this disease are always extremely superficial, as shown by sections of the skin under the microscope. It would add to the value of the book if this aspect of the diseases in general were entered into more fully in future editions.

We gladly welcome books of this kind, written by authors who do credit not only to the specialty itself, but also to general medicine. In fact, the period has arrived when all the broad specialties in their general pathology and treatment cannot be regarded and treated otherwise than as a part of general medicine. A cordial reception should be accorded this useful handbook, well adapted to the needs of the student and the general practitioner. L. A. D.

EPILEPSY: A STUDY OF THE IDIOPATHIC DISEASE. BY WILLIAM ALDREN TURNER, M.D. Edin. Pp. 272. New York and London: Macmillan & Co., 1907.

No one has a better right to discuss epilepsy than Dr. Turner, whose work upon this subject has been so well known for many years. His observations are based upon the study of over 1000 cases. He considers the greatest predisposing cause to be a neuropathic predisposition which manifests itself in various psychical, pathological, and structural peculiarities. He obtained such a history in about 50 per cent. of his cases, but its absence, in his opinion, does not imply its non-existence, in view of the presence of well-marked stigmata of degeneration in many of the cases. He considers that the most common predisposing cause is ancestral epilepsy and that insanity and parental alcoholism exert only a minor and secondary influence.

He states that the most common demonstrable cause of epilepsy is infantile convulsions. Out of 1000 cases 10 per cent. commenced during the first year of life and 34 cases, or 8.7 per cent., had convulsions during infancy and subsequently developed epileptic fits.

The eclampsia associated with the onset of infantile hemiplegia was in 78 per cent. of the cases followed by epilepsy in later life, and he considers that the convulsions associated with the exanthemata, acute infective disorders, and disorders due to toxic influence, including some forms of puerperal eclampsia, should be regarded as manifestations of acute epilepsy. Dr. Turner classifies epileptic attacks into, first, minor epilepsy, dividing this into incomplete and complete attacks; second, into major epilepsy with similar divisions; and, third, psychic epilepsy. In his opinion the feature that is necessary to establish the existence of epilepsy is sudden temporary loss or impairment of consciousness.

When discussing the mental states he classifies these into, first, the epileptic character and temperament; second, the paroxysmal psychoses which either precede or succeed the convulsive phenomena; third, the paroxysmal psychoses which replace single fits or a series of fits, and which have been regarded as psychic equivalents of the convulsive seizures; and, fourth, the permanent interparoxysmal mental condition which is observed in most epileptics, and which should be looked upon as a well-marked and characteristic feature of the confirmed disease. This classification is about as satisfactory as can be made.

The medicolegal importance of the mental states which occur in this disease, especially in the type known as psychic epilepsy, are of the greatest importance. A number of cases are on record in which patients supposed to be in the condition of psychic epilepsy have committed homicide and in the subsequent trials this defence was made. It is rather important to know whether it is possible for a patient who has psychic epilepsy to recall some or all of the details after his attack. The preponderance of evidence seems to be that this cannot be.

The chapter on the pathology of epilepsy was written by Dr. John Turner. He believes that epilepsy is a disease occurring in persons with a defectively developed nervous system, indicated by certain structural peculiarities, and in whom there is a special tendency to intravascular clotting; that the convulsions are a symptom of the disease; that prior to a seizure cortical stasis is induced by the formation of intravascular coagula, which become lodged in some of the cortical bloodvessels; and that in the process of coagulation the blood plates play a prominent part. It is also contended that intravascular coagulation will explain the atrophy and the sclerosis, and the blood tumors found in many epileptic brains. In the former the blockage is believed to take place on the arterial side, leading to starvation of the cortical tissues; while the latter is explained by blocking of the veins so as to cause a local rise in arterial pressure, which results in enormous dilatation of the capillaries.

Dr. Turner defines the cure of epilepsy as the arrest of the seizures for a period of eight or nine years, and according to him it will be found that from 10 to 12 per cent. of cures may be expected. This is a very common-sense view and one to which most neurologists will subscribe. Altogether this is an excellent and, without doubt, the best presentation of the subject of epilepsy. T. H. W.

A MANUAL OF HYGIENE AND SANITATION. By SENECA EGBERT, A.M., M.D., Professor of Hygiene and Dean of the Medico-Chirurgical College of Philadelphia. Fourth edition; pp. 498; 93 engravings. Philadelphia and New York: Lea Brothers & Co., 1907.

THE feature of this book which first impressed the reviewer is the judicious economizing of space which has made it possible to cover the various subdivisions of the subject in an adequate, if not exhaustive, manner within the limits of so small a number of octavo pages as 498, and still leave room for illustrations. Bacteriology is disposed of in one chapter, part of which is devoted to a summary of the theories of immunity. The chapters on ventilation and heating and on the disposal of sewage and house plumbing deal with matters that interest every citizen and householder. The information on school hygiene, both within the schoolhouse and as it applies to the children's home life, and the discussion of practical school questions, such as the proper system of heating and ventilating the schoolroom, the most approved kind of desk and its disposition with reference to the light, the placing of blackboards, the child's position while sitting at the desk, the care of the eyes, and overworking of school children, should be of great value to those intrusted with the care of children and especially to our medical school inspectors. Military hygiene deals briefly with "all phases of the routine life of the soldier," from the selection of recruits to the prevention or control of typhoid fever in camps and barracks. In this chapter the author quotes freely from Vaughn's oration on State medicine, delivered before the annual meeting of the American Medical Association in 1900, and contrasts the conditions which obtained in the United States army in 1898 with the brilliant sanitary record of the Japanese in the Russo-Japanese war, which he attributes to the greater authority enjoyed by the Japanese medical officers in all matters pertaining to sanitation. More thorough instruction in the fundamental principles of hygiene is urged for the national military training school. In the closing chapter the author gives a number of simple methods for the examination of samples of air, water, and foodstuffs, that are within the reach of anyone possessing ordinary scientific training, and such simple apparatus as can be easily obtained or improvised without much expense. The subjects so treated include, besides air and water, milk, butter and oleomargarine, flour, and bread. The author's manner of presentation is clear and concise, his style is as simple as the subject permits, and the book is equally well adapted to the needs of the layman in search of information on practical matters and to those of the municipal or military medical officer who desires a convenient reference handbook.

R. M. G.

A MANUAL OF SURGERY FOR STUDENTS AND SURGEONS. By FRANCIS T. STEWART, M.D., Professor of Surgery in the Philadelphia Polyclinic and College for Graduates in Medicine. Pp. 778; 504 illustrations. Philadelphia: P. Blakiston's Son & Co., 1907.

THIS book was "prepared for the undergraduate whose crowded hours demand a manual stripped of verbiage and unessentials, and for the medical practitioner who seeks a guide to present day surgery." There seems to be a demand by undergraduate students for books of this class, and if such must be supplied the author is to be congratulated for producing a volume of such general excellence. It is a welcome escape from the abominable little quiz compends which flood the medical book market. But this should not be construed to apply to the general practitioner who requires in his every day practice some means of acquiring knowledge of the essentials and of the minutiæ of technique which is usually omitted. The volume, which includes genito-urinary diseases, gynecology, and the essentials of minor surgery, is modern in most particulars, and is much to be commended. G. P. M.

LA PRATIQUE DE LA MÉDECINE. Par WILLIAM OSLER, Professeur royal a l'Université d'Oxford. Traduction française sur la 6e edition par M. SOLOMON, Chef de clinique a la Faculte, et LOUIS LAZARD, Ancien interne de l'Hôpital de Rothschild. Preface du Dr. PIERRE MARIE. Paris: G. Steinheil, 1908.

IT is a source of much pleasure to chronicle the publication of a French edition of Osler's *Practice of Medicine*. Since the book has gone through six large editions in English and is well and favorably known throughout the English-speaking world, little need be said of its intrinsic excellencies. Special interest in the present connection centres in the translation—which has been admirably done, preserving much of the personal flavor, terseness, and lucidity of the original. We commend the book to our French confrères.

A. K.

PROGRESS

OF

MEDICAL SCIENCE.

MEDICINE.

UNDER THE CHARGE OF

WILLIAM OSLER, M.D.,
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Metallic Resonance.—R. Geigel (*Deut. Arch. klin. Med.*, 1907, xc) states that although metallic resonance is an important phenomenon in physical diagnosis, and undoubtedly forms a most valuable sign in diagnosticating air-containing cavities, yet there has hitherto been no satisfactory explanation for the phenomenon. A. Geigel (1856) suggested the higher overtones as a cause, but he did not explain the mechanical conditions for their production. There must first be a clear conception of what is meant by metallic resonance. Physics recognizes simple and compound tones, the latter consisting of fundamental tones and overtones. The lower overtones fuse with the fundamental tone, the higher ones do not, and these produce the phenomenon of metallic resonance. Helmholtz discussed fully the conditions and theory of the production of the higher overtones, and it it is only necessary to repeat briefly his conclusions and to show that the conditions supposed by him actually exist whenever in physical diagnosis we meet with metallic resonance. In any vibrating body the production of the fundamental tone is favored by the continuity of the velocity of the different parts of that body. If there are abrupt transitions in the velocity of neighboring particles, the resultant movement is termed discontinuous, and favors the production of higher overtones with suppression of the fundamental tone. Factors in the production of discontinuous vibration are a hard hammer, a rapid stroke, and a tense, vibrating body, since these hinder the rapid distribution of motion to all parts of the vibrating body.

We may now apply these principles to percussion and auscultation. In eliciting metallic resonance over a cavity, the stroke should be short and sharp and best made with a hammer and pleximeter. The wall of the cavity must be tense. The cavity must be near the chest wall, else the intervening tissue will distribute the impulse over too large a part of the cavity wall, and thus hinder the production of discontinuous motion in the contained air. The cavity must not be too small, else the overtones are too high pitched to be perceived by the ear. Inflated bladders yield at first only a tympanitic note on percussion; with greater inflation, a metallic, note since great tension of the wall is required for the production of discontinuous movements in the contained air. That the note is produced by the air and not by the bladder wall is shown by the greater depth of the tone as the bladder is inflated and the volume of air increased. A higher pitched note would be expected were it produced by the wall itself. Instead, there is a deeper note with the addition of metallic resonance.

In order that the blast of air across the mouth of a jar or bottle should elicit metallic resonance the mouth must be relatively narrow as compared with the greatest diameter of the bottle, and the transition between the two diameters should be abrupt. Discontinuous movements in the contained air may then be produced. The same holds for the production of amphoric breathing in cavities. Other factors are a rapid current and conditions in the bronchi which themselves give rise to discontinuous blasts. Tense, reflecting walls will not in themselves produce amphoric breathing. Falling drops by suddenly disturbing the equilibrium of the contained air at one point produce the characteristic tinkling sound. Metallic rales owe their origin to a discontinuous vibration imparted to the air by the sudden rupture of tough particles. In succussion the metallic sound is produced by the effect upon the air of sudden changes in the surface of the contained fluid. Such changes are impossible in cavities containing viscid secretions. Sometimes metallic sounds are auscultated when the cavities are completely shut off from the air current. In these instances the sounds originate elsewhere and the metallic resonance is a secondary element added by the cavity, which we may think of as having been subjected to a kind of percussion. Examples are amphoric breathing in the neighborhood of a cavity not opening into any bronchus and enclosed pneumothorax; and metallic heart sounds in pneumothorax and in extreme gastric dilatation.

A Granular Form of Tubercle Bacillus Unstainable by Ziehl's Method.—Much (*Beit. z. klin. Tub.*, 1907, viii, 85) comments how frequently one is unable to demonstrate acid-fast bacilli in smears from pearl nodules of cattle when inoculation and culture show the tuberculous nature of the lesion. The same is true of cold abscesses in man. Clinicians have noted, too, the sudden disappearance of tubercle bacilli from sputum in which they had previously been abundant, and after an interval their sudden reappearance. In stained smears from tuberculous lesions in guinea-pigs Much found that frequently a much larger number of organisms could be demonstrated by means of Gram's stain than by the Ziehl or Ehrlich method. Frequently, too, granules were seen taking the same color tone as the bacilli. These granules may be arranged in a typical rod shape, or may be heaped in masses bearing no resemblance to the bacilli. It is these glanular masses which are not stainable by the Ziehl method that Much looks upon as an unusual form of the tubercle bacillus.

A calf that had been inoculated with $\frac{1}{20}$ mg. of virulent cattle tubercle bacilli was sectioned and its lungs found studded with gray miliary tubercles. A large number of smears were stained by Ziehl's method and carefully searched, but no tubercle bacilli were found. Gram's method also gave negative results. Sections of the lung were then cut and stained, and over fifty preparations examined without finding tuberle bacilli or any acid-fast bodies. The usual Gram method was likewise negative, but after leaving the sections for forty-eight hours in aniline gentian violet, and immersing for from five to ten minutes in Lugol's solution, a very unexpected and striking picture was obtained. The tubercles were found filled with small slender rods and in places with granules arranged as rods or heaped in irregular piles. Cultures from the tubercles showed typical tubercle bacilli after fourteen days in the thermostat. A tube removed each day and examined showed by Gram's stain slender rods and granules on the third day, but no acid-fast organisms until the sixth. Pieces of the lung tissue injected into guinea-pigs caused death from general tuberculosis. Three sheep injected with the same culture showed general pulmonary tuberculosis.

In the pus from cold abscesses which contained no bacilli demonstrable by the Ziehl method, but which produced tuberculosis in animals with numerous acid-fast bacilli demonstrable in the lesions, Much found the Gram-staining granules. He was able to show that tubercle bacilli inoculated into milk rapidly lost their acid-fast quality, but were long afterward demonstrable by Gram's method, first as slender rods, then as heaps of granules. As long as these granules were present the milk retained its virulence for guinea-pigs. Much summarizes his work in the following conclusions: (1) There is a granular form of the tubercle bacillus which cannot be demonstrated by Ziehl's method; (2) this granular form is virulent; (3) it may occur in tuberculous organs as the only stainable manifestation of the tubercle-producing agent; (4) it may be associated with a rod form likewise unstainable by Ziehl's method; and (5) there are transition stages, from the granules stainable only by Gram to the Gram-staining rods and to the ordinary acid-fast bacilli. Much suggests that carbolfuchsin stains a different substance in the tubercle bacillus from the gentian violet. Its acid-fast properties probably depend upon the fats it contains.

Skin and Ophthalmic Reactions to Tuberculin.—MAININI (*Münch. med. Woch.*, 1907, liv, 2583) refers to the fact that von Pirquet has found that by applying dilute solutions of old tuberculin to an area of scarified skin a red, erythematous papule develops in individuals with tuberculosis, while no reaction occurs in the non-tuberculous. An extended use of the method has shown that so many apparently healthy adults react that it is useless in diagnosis except in very young children. This large number of reactions corresponds to the frequency with which unsuspected tuberculosis is found at autopsy. In 360 children von Pirquet found that 88 per cent. of the tuberculous reacted positively, the negative cases being advanced or miliary tuberculosis. In 109 non-tuberculous nurslings, only 2 reacted positively. In children from eight to fourteen years of age, however, 35 per cent. of unsuspected cases gave a reaction. In 100 autopsies on children from one to fourteen years of age, who had been vaccinated, he found 30 cases that had reacted all tuberculous, and 17 more of miliary or very advanced tuberculosis that had not reacted. The other 54 were free from tuberculosis and only one had reacted. Mainini reports his observations on 208 cases. Of 24 definitely tuberculous cases, 19 were positive. The 4 negative had very advanced tuberculosis. Of 74 suspected cases, 67 reacted. Of the 7 negative cases, 2 died shortly afterward of advanced tuberculosis. Of 111 patients suffering from various diseases, but in whom there was no cause for suspecting a tuberculous lesion, 89 reacted.

Shortly after the publication of von Pirquet's method, Wolf-Eisner proposed the instillation of tuberculin into the conjunctiva, tuberculous individuals reacting by a reddening of the sac or more marked inflammation. Calmette modified this reaction by using a purified tuberculin. Mainini, in his observations, has used a 5 per cent. solution of the old tuberculin. Of 12 cases of tuberculosis, 11 reacted, the 1 negative being an advanced cae. Of 32 suspected cases, 26 reacted. Of 56 non-tuberculous cases, 8 reacted. These same 100 cases showed the following relation to the skin reaction: In Group 1, 11 cases were positive; in Group 2, 31 were positive; in Group 3, 50 were positive. It is seen that the greatest discrepancy is in the non-tuberculous group, and if the reaction is specific this indicates a greater sensitiveness on the part of the skin. Mainini presumes that more of the specific substances are centred in the skin than in the conjunctiva, which, therefore, requires more tuberculin to liberate a reaction. As is well known, one dose of tuberculin sensitizes to a second, and he suggests the possibility of producing a local hypersensitivesness by repeated instillations. Of 19 cases which failed to react to the first dose, 15 reacted to a second in the same eye. Apparently such repeated applications would put the eye reaction on the same percentage level as the skin reaction. Mainini's conclusions are that the cutaneous as well as the ophthalmic reaction gives a constantly positive result in cases of definite tuberculosis except in those that are far advanced. The specificity of the reaction is probable, but as yet not definitely proved. In non-tuberculous individuals the cutaneous reaction gives about six times higher percentages than the ophthalmic reaction. Assuming that the reaction is specific, this apparently contradictory result leads him to conclude that the ophthalmic reaction indicates more accurately active tuberculous lesions, while the skin reaction includes latent foci.

Influence of the Antiferment of the Blood on the Proteolytic Leukocyte Ferment.—WIENS (*Deut. Arch. f. klin. Med.*, 1907, lxxxi, 456). Müller and Jochmann have shown that washed leukocytes contain a ferment that digests proteids, but that this ferment action is lost if even a small amount of blood plasma be added. Müller and Kolaczek found a marked proteolytic action exerted by fresh pus diluted 640 times, this effect being inhibited by the addition of from five to ten times this amount of serum. This inhibitory action of the serum varies in extent in different individuals and under different conditions; Wiens' object was to determine if such variation is constant and what relation it bears to other pathological phenomena and to associated blood changes. In infectious diseases there is a wide range of variation, but a general principle is found to obtain, namely, that diseases associated with a leukocytosis have a low inhibitive power serum. This is due to the large amount of antiferment used by the disintegrating leukocytes. In 3 cases of sepsis, one a rapidly fatal streptococcic infection, had a high antiferment index; 2 milder cases, a low. Perhaps repeated observations would be of some prognostic value. In cases of pulmonary tuberculosis the index is high, except when a secondary infection associated with a leukocytosis is present. This increase is probably due to the passive congestion. In pneumonia there is usually a marked decrease during the disease with a sudden rise immediately after the crisis, and then a gradual return to the normal. In cases of cardiac disease there is no noticeable variation from the normal. In acute endocarditis the conditions parallel those of sepsis, and in one instance a gradual amelioration of all the symptoms was associated with a definite decrease in the amount of antiferment. Two cases of gastric carcinoma showed no abnormal conditions, while in cases of jaundice there is a decrease. As normal bile contains no antiferment, it must have been altered by the inflammatory changes. In intestinal diseases the quantity of inhibiting substance varies with the extent and character of the lesion. In infections associated with the destruction of leukocyes there is a correspondingly low value. In tuberculous cases it is increased or normal. In only 2 nephritic cases were abnormal conditions found, and in both of these there were abundant pus cells in the urine, indicating an increased destruction of leukocytes. In 3 cases of diabetes and 1 of Basedow's disease there was a low amount of antiferment, for which Wiens could not suggest a satisfactory explanation. The only striking results of the investigation are the lowering of the inhibiting action of the serum in sepsis and its increase in tuberculosis.

SURGERY.

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The Value of Blood Pressure Determination in the Diagnosis of Aneurysm of the Thoracic Aorta.—WILLIAMSON (*Lancet*, 1907, ii, 1516) made investigations in 30 cases of aneurysm of the aortic arch, or ascending aorta in which the innominate artery was involved, to determine whether instrumental examination would show a difference in arterial blood pressure between the two upper extremities. He examined the same point in other series: (1) Cases in which there were the clinical signs of mere dilatation of the ascending part or arch of the aorta; (2) cases either of arteriosclerosis without signs of dilatation of the aorta or else of mediastinal tumors; and (3) cases in which there were no signs of any of these clinical conditions. Stanton's blood-pressure instrument, and Oliver's hemodynomometer were employed. Stanton's instrument gave the more reliable results. Digital exam'nation of the pulses in cases of aortic aneurysm is a far less sensitive method than instrumental, frequently giving results directly at variance with those obtained by the latter means, and hence is of much less value in diagnosis.

Treatment of Urethritis by the Ionization of Silver.—Melun (*Ann. des maladies des organes génito-urinaires*, 1907, xxv, 1681) says that his method, ionization of silver, especially in chronic urethritis, is as follows: A specially constructed straight, black, hardened, hollow, rubber sound, 25 cm. long, No. 18, is employed. From the tip nearly to the opposite end of the sound are a number of small perforations passing from the external surface to the interior. In the lumen is a silver wire extending almost the entire length of the instrument and passing out through an opening near that end of the sound which is to remain external to the urethra. There the wire is to be placed in contact with the pole of a galvanic battery. The external end of the instrument is fitted with a stop-cock. It is introduced into the urethra until the perforated portion is covered. The meatus is pressed about the instrument by an assistant or the patient himself. The stop-cock is opened and a syringe which fits into the open end of the sound is employed to inject into its cavity about 10 grams of a 1 to 2 per cent. solution of silver nitrate. This solution escapes from the sound by the perforations at the sides into the urethral canal, and produces a distention of the mucosa. This puts the silver wire in the sound in conductible communication with the mucosa. The stop-cock is closed and all is ready for the circulation of the galvanic current. The external end of silver wire is then attached to the positive pole of the battery. The negative pole may be placed at any point on the body of the patient, since it plays an indifferent role. The current is then turned on lightly and may be increased to 30 or 40 milliamperes without provoking shock or pain. The patient tolerates this treatment very well for fifteen to thirty minutes. The silver nitrate is decomposed and the ions penetrate the tissues, glands, and mucosa. This result cannot be obtained by any other treatment. An energetic curative action was thus produced in three cases of chronic urethritis.

Sigmoiditis and Perisigmoiditis; Simple Inflammatory Affections of the Sigmoid Flexure.—Patel (*Revue de chir.*, 1907, xxvii, 698) says that it will be difficult to detect the presence of an acute, non-suppurative sigmoiditis when a general disease is present. The perisigmoid collection of pus may be an extension from a pelvic infection in the female, a residual phlegmon in the left iliac fossa, a suppurative intraligamentary cyst of the ovary, or a circumscribed focus of peritoneal fibrocaseous tuberculosis. The diagnosis of such a pus collection due to extension from an ulcer of the sigmoid is very difficult. There are no positive signs, except after operation. Cancer, here, may first be recognized as an abscess. Experience has shown that the evolution of a chronic perisigmoiditis secondary to a sigmoiditis is particularly benign. The infectious process seems to be limited. At times it gives rise to subacute attacks, but it rarely ends in perforation or abscess. Fibrous bands develop around the sigmoid, particularly in its fixed portion and then may lead to an occlusion of the bowel.

Bland-Sutton reported a case, a woman aged sixty years, in which he did a resection for what he thought was an iliac new-growth. The sigmoid flexure was dilated and had rigid walls. In the piece removed he found an epiploic appendage in the centre of which was a fragment of straw. This had been the source of a chronic inflammation which had extended to the loin. The patient recovered without incident. An analagous case was reported by Tuffier, who found some epiploic fringes simply indurated, without thickening of the intestine. The patient got well after a simple laparotomy. Carlson and others believe that these diverticula are more frequently the cause of trouble than is generally thought. Some subacute cases of perisigmoiditis consist of almost acute attacks grafted on an old lesion. They may or may not end in abscess formation. In some cases an iliac swelling of large size may develop with constipation and pain, and the swelling may disappear under the influence of purgatives or proper regimen. Inflammatory strictures may result as the final stage of a sigmoiditis and especially of a perisigmoiditis. Diverticula, when present, do not of themselves cause strictures, but they give rise to a sigmoiditis or perisigmoiditis which determines the stenosis. Two patients of Paviot's died from general peritonitis due to the perforation of a sigmoid inflammatory mass. Inside the bowel in one were some valves forming pouches which contained small fecal masses, and two of these pouches communicated with the abscess and the peritoneal cavity.

Splenectomy for Carcinoma.—Smith (*Annals of Surgery*, 1908, xlvii, 53) reports a case in which, ten years ago he removed an ovarian cyst, the cavities of which were filled with a gelatinous fluid. The same fluid was also found in the abdominal cavity. The walls of the various compartments were partly smooth and partly covered with a proliferating papillomatous growth. The peritoneum throughout was thickened and vascular, and it as well as the uterus and intestines were profusely studded with a growth resembling wet sago grains. The trouble seemed to begin with a pregnancy three years before. Ten years after the first operation Smith again operated on the patient, this time for a carcinoma of the spleen. The patient recovered. Later the abdomen was opened showing the small nodules of the same semisolid growth in the omentum. The following points of special interest are noted: The ovarian tumors probably developed during or soon after pregnancy. The interval between the removal of the ovarian tumors and the splenic growth was a long one. The sago-like growth disappeared entirely after the first operation, and a similar growth appeared in the spleen. The same colloid growth reappeared in the abdomen after the splenectomy, doubtless taking its origin from a part of the spleen where the growth had burst through the capsule. The blood showed slight variations, both before and after operation. There were no symptoms pointing to any organ as the cause of the rapid emaciation and loss of strength.

Splenectomy in Banti's Disease.—TORRANCE (*Annals of Surgery*, 1908, xlvii, 41) collected 35 cases from the literature and added a new one of his own. In the first stage of this disease the spleen becomes enlarged without known cause, is firmer than normal but still preserves its normal color. A progressive anemia develops later with occasional periods of remission. The skin becomes bronzed or pigmented with jaundice. This stage may last from three to ten years. In the second stage, which lasts only a few months, the urine becomes scanty, high colored, loaded with urates and contains urobilin. In the third stage there is ascites with Laennec's cirrhosis. As a consequence of vasomotor paresis of the splanchnic area, arising from disease of the visceral sympathetic ganglia, there is great engorgement of the abdominal viscera, especially of the spleen and liver, and increased hemolysis with consequent oligochromemia and oligocythemia. The increased blood supply to these organs leads to fibrosis and lessened function. The peritoneal effusion is due rather to vascularity than to portal obstruction. Of the 36 patients, 9 died, a mortality of 25 per cent.; 17, or 47 per cent., were females; 15, or 42 per cent., were males; in 4, or 11 per cent., the sex was not given; under twenty years of age 5 or 13.9 per cent.; between twenty and forty years, 18 or 50 per cent.; between forty and sixty years, 6 or 16.6 per cent.; age not given in 7, or 19.5 per cent.

Observations on the Treatment of Fractures of the Neck of the Femur.—WALKER (*Annals of Surgery*, 1908, xlvii, 84) says that of 378 fractures of the femur admitted to the Bellevue Hospital, 112 were fractures of the neck; 9 cases occurred in patients under thirty years of age, and 30 cases under fifty years. During the past eighteen months Walker has employed the Whitman method of treatment in 16 cases. This consisted, briefly, in administering an anesthetic and making gentle examination. The patient was then lifted upon a box or pillows about eight inches high and large enough to support the head, shoulders, and trunk. The pelvis rested on a sacral support, and the extended legs were held by assistants. The fractured limb was held at the normal limit of abduction, about 45 degrees, and traction was made at the same time to overcome the shortening. A plaster spica was so applied as to include the pelvis and crossed below the edge of the ribs. It extended to and included the foot, preventing completely any outward rotation. Walker reached the following conclusions: Fractures of the neck of the femur occur more frequently than was formerly believed. Any injury to the hip followed by disability should suggest the possibility of a fracture of the neck, and requires an expert examination aided by an *x*-ray photograph. Reduction of the deformity with complete immobilization of the fracture during the period of repair is advised by means of a plaster bandage in all suitable cases. This is to be followed by early gymnastic movements, active rather than passive. All weight bearing upon the fracture is to be avoided for from three to four months.

Difficulties in the Diagnosis of Abdominal Tumors.—KROEMER (*Mitt. a. d. Grenz. d. Med. u. Chir.*, 1907, xviii, 440) states that the diagnosis of uncomplicated tumors of the female genital organs should offer relatively little difficulty. They do not always remain confined to the pelvis, but may mount into the abdomen, and even completely fill it. In the consideration of differential diagnosis the text-books usually divide these tumors into the small, moderately large, and very large tumors. A small tumor may remain confined to the pelvis, or by means of a considerable pedicle it is attached to the pelvic organs. If it is from the rectum or urinary bladder, it will usually give signs in the feces or urine before it becomes a prominent palpable tumor. When extragenital tumors have been excluded we may have considerable difficulty in deciding whether we are dealing with an inflammatory exudate, a blood extravasation, as from a tubal pregnancy, or an actual new-growth. The tumors of moderately large size are usually ovarian or parovarian in origin. Next in frequency are the subserous pedunculated fibromas of the body of the uterus. The diagnosis is usually easy until adhesions form, which may lead to an attachment of the tumor to some abnormally placed abdominal organ. It will then not be easy to exclude a pseudotumor or circumscribed tubercular exudate. Exploratory laparotomy will sometimes be necessary finally to establish the diagnosis. One of the important aids lies in the fact that the point of origin of the tumor, as well as the organ from which it springs, preserves its normal situation and its relations to the neighboring structures. Should a supernumerary or descending spleen be the seat of the tumor, the usual diagnosis will be of an abdominal tumor, although the origin will remain in doubt until established by operation. This is true also of tumors of the pancreas, usually. Still greater difficulty will be experienced when an ectopic, as a pelvic kidney, is the origin of the pathological process. The existence of multiple tumors is also a cause of failure in diagnosis. Since it is more likely that there is a single cause for the tumors in women, one thinks first of the ovaries as the seat of origin. Frequently both ovaries are involved. Echinococcus cysts, multiple ovarian cysts, and cysts of the mesentery cannot always be differentiated with certainty. Occasionally tumors of doubtful anatomical structure may present insuperable difficulties in diagnosis. These are usually retroperitoneal or between the layers of the mesentery. Sometimes these are myomas, sometimes fibromas, and they are frequently malignant. When the whole abdomen is filled by the tumor, and the abdominal organs are compressed together into a small space, an exact diagnosis will usually be impossible, and a laparotomy will be necessary to establish the actual circumstances of the case and to select the proper treatment.

The Extirpation of Malignant Tumors of the Tonsillar Region.—CLAIRMONT (*Zentralbl. f. Chir.*, 1907, xxxiv, 1393) says that resection of the lower jaw for the removal of tonsillar carcinoma which has extended to the surrounding region was recommended by Mikulicz and Kuster more than twenty years ago. Mikulicz divided the jaw 1.5 cm. anterior to and again 0.5 to 1 cm. above the angle, thus avoiding the attachments of the masseter and pterygoid muscles. Küster divided the bone in the line of the skin incision, which ran from the angles of the mouth downward and backward across the masseter muscle to the anterior border of the sternomastoid. While this method permits an extensive exposure of the lateral pharyngeal wall, and almost to the end an extramural and pharyngeal operation, it results in a crippling and disturbance of the movements in the jaw. The portion of the jaw involved by the growth has been excised during the operation. In one case operated on by Kocher the jaw was divided in the median line, the muscles in the same line, and the mucous membrane alongside the tongue, with a resulting excellent exposure of the affected region. Recently good results have been obtained in cases in which a portion of jaw was resected, by the immediate introduction of a prosthetic apparatus to replace the resected portion. Clairmont operated on two cases by the Mikulicz-Kuster method, with the immediate replacement of the resected portion by a prosthetic apparatus. One patient died ten days after operation from an erosion hemorrhage from the common carotid. In the other case, five weeks after operaton, the temporary prosthetic apparatus was replaced by a permanent one. A preliminary tracheotomy does not seem to be necessary, because the patient is placed in a high position with an inclination of the head, so that the blood can escape easily from the wound during the operation, and its aspiration is thus avoided. The temporary prosthetic apparatus proves its value during the first days after the operation, in the fact that the patient can expectorate better than after the temporary splitting of the jaw with reunion of its fragments by sutures.

Experimental Generation of New Collateral Vessels for the Kidney.—Girgolaff (*Zentralbl. f. Chir.*, 1907, xxxiv, 1444) calls attention to the excellent results obtained from Edebohl's decortication operation on the kidney, and to the claim that they are due to the abundant blood supply from the new-formed capsule. More recent writers have been inclined to consider that there are fewer vessels in the new-formed cicatricial capsule than were present in the normal capsule, and efforts have been made to replace the original method by a more efficient one. On the lower animals the decorticated kidney has been surrounded by omentum, and it is to this phase of the subject that Girgolaff devotes his attention. He performed a series of operations on cats, after the following method: Decortication and encapsulation in omentum. After one and a half, three, five, and eight weeks, the animals were killed and the bloodvessels were thoroughly washed out with salt solution through the thoracic aorta. The abdomen was then opened widely and the vessels of the kidney hilum and all adhesions of the kidney except the omental stump were divided between ligatures. The kidney was then attached merely by the omental attachment, and it was then injected with Berlin blue through the aorta. The colored material could reach the kidney only through the bloodvessels of the omental attachment. It was found to have reached the cortex and the medullary substance as far as the papillæ, and it could be seen macroscopically. The intensity of the injection was found to have increased with the interval between the time of the operation and the injection. He therefore concludes that a more abundant permanent collateral circulation was produced by grafting the omentum to the kidney than by Edebohl's method.

THERAPEUTICS.

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The Vasodilators in Cardiac Disease.—Franze (*Folia Therapeutica*, 1907, i, 73) states that the peripheral resistance in the arterial system is an important factor in the treatment of heart lesions. In the control of this resistance the several drugs most commonly used are glyceryl nitrate, amyl nitrite, sodium nitrite, and potassium and sodium iodide; the last two being most usually employed. They act by lessening the viscosity of the blood and thus diminish the resistance due to this factor. The preferable method of administration of the last is to give $1\frac{3}{4}$ to 5 grains five times daily for a period of two or three years; in every month a pause of one week, and after every three months a pause of a month, should be made. Other substances which may be employed to lessen high arterial tension are isobutyl nitrite, hydroxylamine hydrochloride, and diuretin, which last is to be preferred since it is practically free from undesirable by-effects.

Creosote Carbonate in Bronchial and Pulmonary Affections in Infants.—John (*Therap. Monats.*, 1907, xxi, 516) draws the following conclusions from his observations of the action of this substance in 100 non-tuberculous patients: Creosote carbonate possesses a distinct curative action in the various bronchial and pulmonary affections; whether these be due to Fränkel's pneumococcus, the streptococcus, Friedländer's pneumonia bacillus, the staphylococcus, or to other causes. Whether this is due to its preventive influence upon bacterial growth or to the fact that it exerts a reparative action upon the local process or whether it combats the products of the growth of the bacteria in the organism it is not possible to do more than theorize. The results show that creosote carbonate is an agent of considerable efficacy, and one worthy of more extended use.

Calcium Chloride in Therapeusis.—Carles (*Journal de médecine de Bordeaux*, 1907, xxxvii, 472) considers calcium chloride a most useful drug, and cites the following indications for its employment: It was first used in the control of hemorrhage, epistaxis, hemoptysis, etc., and in hemorrhoidal bleeding and hemophilia. Here it acts by increasing the coagulability of the blood. On account of its influence in the production of fibrin-ferment it possesses a favorable effect in urticaria and acute œdema; it is particularly useful in the urticaria resulting from the injection of therapeutic sera and in that due to intoxication. Its antihemolytic action renders it useful in bilious hemoglobinuric fever. In nephritis it sometimes reduces the albuminuria, the reduction being due to its antihemolytic action, to its antitoxic effect, and to its antagonism to the sodium ion, the latter being increased in renal lesions; also in small doses it is diuretic. Its effect in lessening nervous excitability gives it a field of usefulness in tetany, glottic spasm, convulsions, and laryngismus stridulus. As a cardiac tonic it increases the force of the heart and lowers arterial tension, and in pneumonia it has a neutralizing effect upon the accumulation of the sodium salts in the organism. The drug is easily taken in doses of from 15 to 60 grains daily in milk, beer, or syrup of peppermint. It is important to interrupt its administration for one day in every four, and to suspend treatment every eight or ten days. In aged patients, who are liable to calcium retention, it should be avoided for its administration may result in calcification of the vascular system.

Mercury Bibromide in Syphilis.—Dalimier (*Revue de thérap.*, 1907, lxxiv, 638) recommends the following formula as being particularly effective in the nervous lesions of syphilis: Mercury bromide, 27 grains; sodium bromide, 21 grains; sterile water to make 2½ drams. The mixture is employed as an intramuscular injection, and has the advantage that it causes no pain.

Vaccine Treatment in Skin Diseases.—Whitfield (*Journal of Cutaneous Diseases*, 1907, xxv, 529) considers that vaccine treatment foreshadows an enormous advance in our control of infective disorders, but our present lack of knowledge renders results uncertain in some instances. The vaccine treatment of boils is uniformly successful, and is the only reliable treatment for furunculosis. In sycosis the treatment is a valuable aid, but must be continued for long periods and is best combined with *x*-ray depilation. In acne the treatment is uncertain, sometimes proving successful and at others of no avail. In septic dermatitis and ulcers the treatment is valuable as an auxiliary. In Bazin's disease it is uncertain, but sometimes of assistance. It is of great value in tuberculous ulceration. In lupus the treatment alone is too slow and uncertain to be recommended, but may prove of value in preventing relapse after treatment with Finsen's light, and it may be combined with benefit with the *x*-rays.

The Treatment of Laryngeal Tuberculosis.—Jurasz (*Deut. med. Woch.*, 1907, xxxiii, 1073) recommends in the prophylaxis of this condition the inhalation of sprays of alkaline or sodium chloride solutions, the employment of expectorants and balsam of Peru, and disinfection of the sputum. In local treatment the astringents should be avoided, but insufflations of boric acid, orthoform, or iodol may be employed. The infiltrations of the posterior wall of the larynx and of the interarytenoid fold may be curetted and cauterized with 30 to 80 per cent. lactic acid; the galvanocautery may also be used here. The infiltrations of the arytenoid cartilages should be scarified. The direct action of the sun's rays and treatment by Bier's hyperemia, especially the latter, give good results in instances of pain. Tracheotomy, performed to relieve dyspnœa, also benefits the local condition. Perichondritic inflammations may necessitate incision, and in involvement of the epiglottis ablation may be indicated.

The Treatment of Enteric Fever.—Tutsch (*Allg. Wien. med., Zeitung*, 1907, lii, 333, 343) has treated enteric fever for the past five years in the following manner: While the certainty of the diagnosis is not assured the patient receives 7½ grains of quinine hydrochloride daily. When the diagnosis is certain this is replaced by an emulsion of 3 drops of creosote carbonate, 3 drops of eucalyptol, and about ½ ounce of boiled milk or wine of condurango; this is given thrice daily. Twenty-six patients thus treated recovered without complications, and their symptoms became rapidly ameliorated. The course of the disease usually lasted about four weeks, but in a few instances the temperature fell before this time had elapsed.

A New Treatment for Diabetes Mellitus.—Soules (*New York Med. Jour.*, 1907, lxxxvi, 929) reports a patient affected with diabetes mellitus in whom he has achieved a cure by means of the administration of the fluidextract of chimaphilia, 2 drams in a glass of milk at each mealtime. The drug acted best in connection with an antidiabetic diet. As soon as the sugar disappears from the urine it is advised that arsenic be added to the medication in doses gradually increased to medium dosage. This should be continued for at least two months, and if the sugar does not re-appear starchy diet may be very gradually resumed reducing the chimaphilia one-half. If the glycosuria re-appears the starches should be omitted and the full doses resumed. After a few weeks the starches may be again allowed with caution and so on until the patient is cured.

Santonin in Diabetes.—According to Bernard (*La quinzaine thérap.*, 1907, viii, 415) the treatment of diabetes by santonin gives constant results in all types of diabetes. In the mild instances about $\frac{3}{10}$ grain, combined with a vegetable cholagogue, is given twice daily with the principal meals; in the more severe forms a third dose is added at breakfast time. This medication is continued for three weeks and is followed by an intermission of from one to two weeks during which the patient's hygiene is regulated and his diet restricted. Other courses of santonin treatment are instituted depending on the persistence of the glycosuria. The alkalies are entirely compatible with the santonin and afford a useful adjunct to this form of treatment.

The Prolonged Administration of Digitalis.—Achert (*Berl. klin. Woch.*, 1907, xliv, 1115) considers digalen (soluble digitoxin) the preparation to be preferred in order to avoid cumulative effects. It is especially useful in myocarditis, cardiac weakness of chronic type, and in the cardiac disorders which occur in chronic nephritis. The ordinary dosage is from 7 to 14 drops of the solution in which the drug is marketed; these quantities may be administered for continued periods in the above affections without causing unpleasant by-effects.

The Opsonic Treatment of Tuberculosis by Tuberculin.—Turton (*The Practitioner*, 1907, lxxix, 650) reports results of the treatment of seventeen patients by this means, and summarizes as follows: Seven of the patients did very well and four others showed most encouraging improvement as a result, in his opinion, of the tuberculin injections. Other patients were less favorably affected. Of the causes of failure probably the first was that the treatment was not begun early enough in the diease; here the immunizing power may be exhausted, the general nutrition at a low ebb, and the tissue destruction so great that recovery is hardly possible. Economic conditions also often interfere with success, for instance some patients cannot be removed from unsanitary surroundings, and it may be impossible to procure proper food for them. Failure also may be due to the fact that it is impossible to inject, in each instance, a specific tuberculin manufactured from the particular strain of tubercle bacilli. In other than tuberculous affections the greatest advantages are to be obtained by injecting the patient with a vaccine made from his own infective organisms, and possibly greater success might be attained from a similar process in tuberculosis. Another bar to success in this form of treatment is the presence of a mixed infection. The doses used varied from $\frac{1}{400}$ to $\frac{1}{2000}$ milligram of a tuberculin solution diluted with 0.5 per cent. phenol so that 1 c.c. contains $\frac{1}{500}$ mg. of solid substance. The periodicity of the injections varied from four to twenty-one days. He is not inclined to abandon the use of the opsonic index in carrying out the treatment, but considers careful attention to the patient's reaction, as shown by the index, to be essential to successful vaccine treatment.

Tuberculotherapy in Tuberculosis.—Ross (*New York Med. Jour.*, 1907, lxxxvi, 869) advocates the feeding of tuberculous patients with the raw or partially cooked meat from tuberculous animals. Such meat contains the toxins and antitoxins of the animals in proportion as their blood serum has had the power, and the muscular tissue and blood serum of a tuberculous animal are the main sources of that animal's resistance; and so their flesh possesses immunizing qualities, hitherto not deliberately utilized to cure disease. The exhibition of raw meat to phthisis patients is an inexact process since meat from a tubercle-free animal and meat from a tuberculous animal are mixed from day to day. It is only by obtaining tuberculous meat and administering it in an exact and scientific manner that the full benefits in which Ross believes can be obtained. Accurate methods which he describes enable one to administer to a patient a measured quantity of meat containing tuberculotoxins and antitoxins, and to observe their reactions with some degree of accuracy.

Antituberculosis Serum and the Tubercle Bacillus.—Binswanger (*Zentralbl. f. die gesammte Therapie*, 1907, xxv, 454), in reviewing Marmorek's work and that of others on this subject, states that tuberculin has given very satisfactory results in the treatment of bone and joint tuberculosis, but that in the pulmonary form of the infection its action has been much less effectual. This is explained on the ground that in pulmonary tuberculosis there is usually present a mixed infection which militates against the beneficial effects of the tuberculin. On this account Marmorek immunized his "antituberculosis horses" against the streptococcus, thus producing a "double serum." The statistics of this serum are, however, at present too few to allow of definite conclusions being drawn.

Specific Action of Moebius' Antithyreoidin.—HOLST (*Klinisch-therap. Woch.*, 1907, xiv, 1084) is firmly convinced that this preparation possesses a specific action in exophthalmic goitre. To strengthen his assertion he reports a patient who was suffering from the disease in its typical form and in whom the iodine treatment had no effect save to induce rhinorrhœa and acne, but who immediately began to improve under treatment by antithyreoidin. The goitre became smaller, the palpitation, tremors, exophthalmos, and headache less, and in about six weeks the treatment was stopped and the patient was discharged. Two months later she reported that there had been no recurrence. Holst considers the fact that the severe headache from which the patient suffered, and which had been rebellious to all forms of antineuralgic and counterirritant treatment, disappeared under the administration of the antithyreoidin is a strong point in favor of the specificity of this agent. The dosage which the patient received varied from 5 to 30 drops daily.

PEDIATRICS.

UNDER THE CHARGE OF

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Bacteriological Infection of the Urinary Tract in Childhood.—C. R. BOX (*Lancet*, 1908, i, 77) classifies infections of the urinary tract in children as descending and ascending infections, and those by contiguity. Descending infection is also termed hematogenous, and is not by any means a common occurrence. The body can dispose of enormous numbers of bacilli (proved by injection) without their appearing in the urine or other secretions. When they do appear, the time of their appearance and the substances which appear with them lead to the presumption of renal damage. The quantities which appear in the urine are not in any way comparable to the quantities injected. Bacilluria is usually due to an ascending infection, and the ureter is the common highway of infection. The commonest infection in children is due to the colon bacillus. The more frequent occurrence of these infections in girls than in boys is due to the shortness of the female urethra and the proximity of its orifice to the anus. The colon bacillus is frequently found in the urine of children suffering from thread worms; the ova and the worms even have been found there, thus suggesting that they may carry the colon bacillus into the urine and even the bladder.

The clinical manifestations of infection of the urinary passages in childhood may be pyelitis, cystitis, or incontinence of urine without obtrusive evidence of local inflammation. Pyelitis may occur as a febrile affection with sudden onset, chills, and pyrexia; the possibility of its presence should always be borne in mind when dealing with cases of obscure fever in childhood, whether of a sustained, remittent, or relapsing character. Shivering and rigors especially should direct attention to the urinary tract. Gastro-intestinal disturbances, pneumonia, tuberculosis, and malaria may be closely simulated. Cystitis of a more or less acute character is not uncommon in childhood; no definite cause is usually apparent; the fever is usually very high, although mild attacks may also occur. Incontinence of urine may be associated with bacilluria; the organism is almost invariably the colon bacillus. A trace of albumin is often present in these cases, but casts are always absent. The cases are often associated with slight elevation of temperature at night. The cystitis of childhood when due to the colon bacillus demands a guarded prognosis. Acute cases improve usually, others less acute drag on indefinitely. The preventive treatment includes frequent bathing and the avoidance of contamination from the anus. Vulvitis must be promptly treated. Mild cases of pyelitis, cystitis, etc., require full doses of citrate of potassium with belladonna. In severe cases thread worms must be carefully looked for and treated if found; drugs have been invariably disappointing; serumtherapy led to improvement in only one case.

Precocious Menstruation.—W. Stoelzner (*Med. Klinik*, 1908, iv, 5) reports the case of a girl, aged two years and ten months, who had menstruated since her twenty-fourth month. At first the intervals between menstruations were eight weeks, but now they are only five weeks. The breast development is that of a girl fourteen years old, and the vulva, uterus, and other internal genitalia (examined per rectum, although the vulvar orifice was large enough to admit the finger) also showed a remarkable development. There was no hair development. At birth, and for some time after, the child appeared perfectly normal, but at the present time the general features of the child give it the appearance of being at least five years old.

Estivo-autumnal Fever in a Child Two and a Half Years Old.—R. A Clock (*Archives of Pediatrics*, 1907, xxiv, 918) reports the case of a girl aged two and a half years, who had been perfectly well until suddenly she complained of abdominal pain and vomited; the vomiting was repeated five times. Marked symptoms of pulmonary congestion were present, which, however, soon disappeared. Remittent fever (varying 3° to 4° daily) was present, but only a moderate increase in respiration and pulse rate. On the fourth day the spleen was found enlarged and easily palpable. The temperature range on this day was 6°; there was no chill, no sweating, no cyanosis, no pallor, no discomfort outside of marked restlessness and peevishness. The finding of malarial plasmodia on the seventh day established the diagnosis; there were hyaline bodies, crescents, signet-ring shaped organisms, and one ovoid. Aristochin in 40 grain doses daily checked the process at once. The following points are emphasized by the author: The marked pulmonary symptoms present at the onset of the disease, masking the real infection; the absence of typical malarial symptoms; the prompt and permanent action of aristochin; the relatively infrequent occurrence of the disease in this latitude in so young a child; and absence of any positive infection.

Malnutrition in Older Children.—A. Friedlaender (*Lancet-Clinic*, 1908, xcix, 53) writes of malnutrition in older children independent of primary organic disease. Such children are more liable to infections, and should, therefore, especially as there are very many, be given considerable attention. Apart from their physical deficiency such children are frequently easily picked out because of their mental precocity. Of the etiological factors in malnutrition heredity is probably the most important. The parents of such children have delicate constitutions, they may have tuberculosis, gout, syphilis, or be alcoholics. The children inherit a highly developed nervous system with a corresponding amount of physical deterioration. Other causes are improper feeding in infancy, bad hygienic surroundings, especially a lack of fresh air due to fear of "catching cold," education at the expense of physical well-being, too much society and insufficient amount of sleep, too many after-school lessons (music, drawing, dancing, etc.). The characteristics of such children are carefully described by Friedlaender. He emphasizes their tendency to catarrhal inflammations of the mucous membranes; their vulnerability is very striking, and slight causes in them produce very marked effects; gastro-enteritis may be brought on by a slight deviation in diet, a long, persistent coryza from slight exposure to dampness. The treatment should include regulation of diet and general hygiene; regular meal hours, three meals per day; nothing between meals, especially no candy or other sweets. The food should consist of meat, eggs, milk, vegetables, cooked cereals, bread, butter, fruit, and light cakes. A daily afternoon hour for rest and an early hour for bed should be insisted on. Outdoor exercise is necessary, and several hours daily are not too many. The windows should be kept open, more particularly at night. Cold sponging is only suitable in children who react readily from the shock. Mental overexertion is to be curbed. Medicinal tonics are suitable; the iodides are excellent alteratives, especially in recurrent bronchial attacks.

The Bacteriology of Meningitis.—F. S. Churchill (*Archives of Pediatrics*, 1907, xxiv, 881) has studied 26 cases of meningitis in children from the standpoint of its etiology, the extent of variation of its organisms, the manner in which the organisms gain access to the system, the difference between the different types of organisms and the prognosis in the various forms of the disease. His cases include 3 of tuberculous meningitis. He found that meningitis in early life is caused by a great variety of microörganisms, chief among which in frequency are Diplococcus intracellularis meningitidis, or the meningococcus of Weichselbaum, and the pneumococcus of Fraenkel. A large proportion of cases, especially in epidemics, is due to the menigococcus. A considerable number of cases, however, was due to the pneumococcus, variously estimated at from 11 to 22 per cent. in epidemics, and higher in sporadic cases. Mixed infection he found very rarely. He found the meningococcus very wide-spread in its distribution in the body. It gains access to the system through the nose and throat. It produces a true meningococcic septicemia. He found the meningococcus in the nose and throat of healthy individuals living in close contact with meningitic cases of this type. Such individuals should be isolated, as by their presence abroad they help to spread the disease. The type of meningitis cannot be determined from the clinical picture. This can be done only by lumbar puncture. The prognosis in the pneumococcic variety is more unfavorable than in other types. Meningitis due to almost all the known pathogenic bacteria does occur, but is infrequent. As the meningococcic is the only type which is really contagious, the throat and nose and also the spinal fluid of all cases should be examined to determine the variety present in order to protect the community. The meningococcic cases certainly should be quarantined, possibly also the pneumococcic.

OBSTETRICS.

UNDER THE CHARGE OF

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Operative Treatment of Intracranial Effusions of Blood in the Newborn.—Seitz (*Zentralbl. f. Gyn.*, Nr. 30, 1907) reports the case of a primipara with normal pelvis, who gave birth to twin children. The first was born spontaneously; the second was expelled spontaneously thirty hours after the first, in the second position, vertex presentation, the expulsive period of labor lasting five hours. The child was not asphyxiated at birth. Over the left eye and side of the face there was œdema. There was a caput on the occipital bone; the parietal eminences seemed to be forced outward, and the greater fontanelle was wider than normal and also the frontal suture. The bony development of the cranium seemed normal.

At first the child was quiet and took nourishment, slept, had no vomiting, and the mother noticed nothing unusual about it. Early on the third day the child was quiet, but was noticed to be pale, with very slight jaundice. The greater fontanelle was very tense and distended and on palpation rhythmical beating could be heard; this was synchronous with the heart. The breathing was regular eight to ten times in each fifteen seconds, occasionally becoming slightly irregular, and was reasonably deep. The skin of the child was slightly mottled, and the sagittal suture somewhat wider than normal. The right leg of the lambdoid suture was wider than the left, and over the right parietal eminence the veins were distended as far as the right ear, while a vein on the left side between the forehead and the vertex was also distended. The child seemed perfectly apathetic, turning the head more toward the left, but lying as it was placed.

The child would open the left eye widely from time to time, while the right remained closed. The eyes were turned toward the right; the left could be easily opened, while the right was held tightly shut. The left corner of the mouth was a little higher than the right, but when the child cried the retraction of the left side was not seen. Evidently the upper portion of the facial nerve was paralyzed. The left pupil was very tightly contracted and the right considerably wider. When the child's head and face were tapped suddenly over the facial nerve a convulsive movement followed; the head was drawn to the right, the left sternocleidomastoid muscle contracting; the right was drawn in a tonic spasm; the left eye was one-half open, the right held tightly shut, and both eyes were directed toward the right and below; the forehead was wrinkled; the breathing became irregular when the child cried. After such an attack the left eye remained more widely open. The child's neck moved freely; the back was somewhat stiff, the left arm easily contracted. There was no difference in the reaction of the legs. The left patellar reflex was more than the right. During the day the condition of the child became worse. The left eye remained widely open; the inferior portion of the facial nerve showed no especial paralysis; the right pupil dilated and the breathing became shallow and irregular. There were no convulsive efforts at respiration, but the child was pale, slightly jaundiced, the temperature subnormal; while if the child's body was pressed upon œdema easily developed. The greater fontanelle was widely distended, and lumbar puncture gave 1 c.c. of slightly blood-stained fluid. The diagnosis was made of intracranial hemorrhage with pressure, and it was thought that the bleeding was situated in the left optic thalamus. The great alteration in the breathing led to the belief that an accumulation of blood had formed beneath the tentorium. The child's head was prepared by shaving and an incision made on the right side extending in a curved form over the region where the hemorrhage was suspected. The vessels in the incision did not bleed with especial freedom. The periosteum was separated over the bone through the extent of the incision 1 cm. in width. Beginning at the external lateral border of the greater fontanelle, the edge of the bone was freed with the knife over the extent of 3 cm. The dura was separated from the bone and opened with blunt scissors in such a manner as to turn the entire right parietal directly outward. The dura was not especially tense and showed a pale-blue color. The dura was incised with the point of the knife, when blood, in a considerable stream, spurted out. The incision was then enlarged, the clot removed, and an effort made to remove entirely the blood by sponging with gauze. The hemisphere was then irrigated with salt solution, the dura closed with catgut stitches, the parietal bone replaced, and the skin incision closed. An antiseptic dressing was applied and by adhesive plaster made firm over the whole area. The operation was done without anesthesia and the child was comatose in the beginning. After the dura was incised the child breathed more freely and cried. The left eye was closed, but there was no evidence that the relief of cerebral pressure influenced the sensibility of the child. As the infant was anemic through loss of blood, 50 c.c. of salt solution were injected beneath the skin. The child was then placed in an incubator. The operation had consumed twenty-five minutes. During the next few hours the left eye again became closed, the child passed into coma, took no nourishment, had subnormal temperature, and died ten hours after the operation. Autopsy showed that the left hemisphere was entirely free from blood, but over the right, in the posterior and anterior portions, there were small coagula, but that the large clot had been removed by operation and there had been no bleeding afterward. In the region of the cerebellum the tentorium was found distended with blood which reached to the medulla. This blood could not be removed through incision and was the cause of the death.

Seitz further reports the case of a primipara with a normal pelvis, delivered in spontaneous labor, the presentation and position of the child being normal. Heart sounds during the latter part of labor were good, the pains were not especially strong, and the head passed rapidly through the birth canal. The body was not delivered at once and the child became cyanotic and required assistance in the delivery of the shoulders. Respiration and crying occurred naturally and there was no discharge of meconium in the amniotic liquid. The child was a male of normal proportions. The bones of the head were somewhat hard, they were forced over each other to some extent, and the greater fontanelle was wider than normal; the caput small. Immediately after labor the child showed nothing especial. It nursed naturally and cried during the night and continued during the following few days to be apparently well, except that the mother noticed some jerking movements of the head. On the morning of the second day, forty-two hours after labor, the child had a sudden and severe attack of cyanosis, for which it was immediately placed in a warm bath. These attacks were repeated, the right leg and arm becoming spasmodically contracted; the arm was slightly flexed, the hand drawn inward and also the thumb and finger. The left side showed decided stiffness, but there were no spasmodic contractions. The greater fontanelle was not tense. The head was directed most of the time toward the right; the lids of the left eye were closed; the right eye could easily be opened. Both were directed downward, showing only the whites. There were convulsive movements about the mouth and eyes. The child seemed much improved by a prolonged warm bath, and efforts were made to assist the respiration by passive movements. Lumbar puncture gave 1 cm. of a faintly bloody fluid. The child became worse and died, the body before death becoming covered with bluish-red blotches, the skin of a grayish-bronze appearance. Death ensued forty-eight hours after birth. Upon autopsy the dura was loosened from the bones over the right and left parietal eminences. When the dura was opened it was found that the vessels of the pia mater were greatly distended with blood, the veins appearing like thick cords, with very slight extravasation of blood from the vessels. The longitudinal sinus was greatly distended. The tentorium was distended with blood, so that both hemispheres of the cerebellum and medulla were covered with fluid blood. The ventricles were free from blood; and death in this case occurred from the accumulation of blood beneath the tentorium.

Roentgen-ray Examination after Pubiotomy.—Frank (*Zentralbl. f. Gyn.*, 1907, Nr. 30), after two cases of pubiotomy, studied the condition of the pelvis by the Röntgen rays. His first case was that of a woman with a generally contracted pelvis, with a true conjugate of 8 cm. The pelvis was opened with a saw and the child safely delivered with forceps. The second patient had a flat pelvis, with true conjugate of 9 cm. There was a laceration of the vagina connecting with the wound in this case. The wounds were sutured and drained with iodoform gauze, the patient making a good recovery. In both these cases the Röntgen rays revealed a fibrous union between the bones. There seemed to be no effort to form bony tissue.

Abortion Produced by the Roentgen Rays.—FRAENKEL (*Zentralbl. f. Gyn.*, Nr. 31, 1907) reports the case of a tuberculous patient, in whom it was determined to interrupt pregnancy with the hope of checking the tuberculous process. Twenty-five applications of the Röntgen rays were made, each lasting from five to ten minutes. After each five days a pause of one day was allowed to intervene before new applications were made. The region over the ovaries and the thyroid gland were chosen for the applications. Especial care was used to avoid injury to the skin. Spontaneous abortion occurred with free hemorrhage, which ceased when the uterine contents were expelled. No vaginal examination was made during the case, so that the effect is attributed entirely to the Röntgen rays.

GYNECOLOGY.

UNDER THE CHARGE OF

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Primary Fibro-myomas of the Broad Ligaments.—JAMES VANCE (*Annals of Surg.*, 1907, xlvi, 854) reports a case in which the presumptive diagnosis was the same as this title. He comments on the divergence of opinion as to origin of the fibromyomas found in the broad ligament apparently unattached directly with the uterus, admitting the preponderance of evidence and opinion is that they spring from the uterus, and then proceeds to substantiate his belief to the contrary. He admits such broad ligament origin is very rare, stating that in American medical literature of the last eleven years but four cases of true broad ligament fibromyomas with normal uterus have been recorded, but presumes to demonstrate these were not of uterine origin.

It is very probable that all fibromas and fibromyomas lying just without and immediately connected with the pelvic peritoneum are of uterine origin. Exceptions to be noted are those springing from the ureter, bladder, ovary, Fallopian tube, and rectum and retaining direct connection with the site of origin. The subject of migrant and parasitic tumors of the pelvis has been carefully studied by Cullen, Stone, Douglas, and others, not alone from the view-point of literature, but from the clinical and pathological aspects. Their structure in no way varies from that of the same variety of neoplasm originating in the uterus, while primary growths of the broad ligament might be expected to contain striated muscle fiber, inasmuch as such tissue exists in the broad ligament and not in the uterus. Moreover, when we must conclude that mucoid neoplastic inclusion of portions of the endometrium of Gaertner's ducts is the sole cause of mucoid degeneration of uterine growths of this nature and the existence of islands of mucosa within them, together with epitheliomatous transformations thereof, we have reason to believe neoplasms of broad ligament origin should at least occasionally contain structures that do not exist in the uterine body, but none such have ever been recorded.

The Treatment of Pelvic Infections.—C. W. Barrett (*Annals of Gyn. and Ped.*, 1907, xx, 488) discusses this subject in a lengthy paper. He emphasizes the fact that the disease is an infection and that the inflammatory process is not a disease but an attempt of nature successfully to resist the onslaught of the infection. Barrett declares that pelvic inflammation has not the power of self-extension, but rather tends to repair; that during the acute stage of a pelvic infection operative intervention should not be employed until determination that drainage or removal of some organ will remove or decidedly lessen the source of infection, when drainage, or the removal of the uterus or a tube or an ovary, may be clearly required; for the inflammation, *per se*, the removal of acutely inflamed pelvic organs is not indicated; non-puerperal, non-operative, acute infection is usually, but not universally, of gonorrhœal origin; and that an acute primary infection of the appendages should receive early conservative treatment, although drainage to save life or hasten convalescence is often required. Barrett advises removal of chronic pus tubes, but in the presence of active infectious processes advises vaginal incision and drainage as a preliminary procedure, a radical operation to follow when necessary after the disappearance of the acute infection.

The Renal Catheter as an Aid in the Diagnosis of Valve-like Obstruction of the Ureter.—J. A. Sampson (*Annals of Surg.*, 1907, xlvi, 870) describes two interesting cases in which use of this instrument was relied upon for diagnosis, and in one of them the diagnosis was confirmed by operation. By coating the catheter with wax Sampson was able to locate multiple constrictions. To the inexperienced, and but few can lay claim to experience in ureteral catheterization, passing of ureteral catheters may seem to be a quite simple procedure. Perhaps those having a fairly large experience in surgery of the kidney and ureter, with some but less experience with the various mechanisms employed as aids in diagnosis, there appears a better estimate of the practical value of such so-called instruments of precision. For example, there is probably not on record a case of fused kidney diagnosed before operation by these methods, although it is evident catheterization of the uteters in such condition has been attempted.

Instrumental Perforation of the Uterus.—Kuntzsch (*Zentralbl. f. Gynäk.*, 1907, xxxi, 1590) comments on a number of cases of perforation of the uterus which have come under his observation. Some of these were due to the use of a curette by skilful operators, which leads him to think that many accidents of this kind are to be attributed to the instrument used or to the conditions of the uterus rather than always to want of skill, as frequently stated. Kuntzsch calls attention to three cases in which laparotomies were performed and scars found in the fundus of the uterus, indicating old perforations. The history of these cases showed that a curettage had been done but that no symptoms suggestive of perforation had been observed. He thinks, therefore, that perforations of the uterus are more common than is generally believed.

Operative Treatment of Purulent Parametritis.—C. FRANCKE (*Zentralbl. f. Gynäk.*, 1907, xxxi, 1597) describes a large abscess of puerperal origin that was drained through a small incision made above Poupart's ligament. The opening failed to close for a year, when an operation was performed, the fistulous tract being removed and a considerable portion of the ileum resected. The abscess cavity was thus obliterated and the result of the operation was successful. In similar cases in which the abcess walls can not contract to obliterate the cavity Francke thinks that there should be no hesitation in making an extensive resection of the ileum.

Ventral Fixation of the Round Ligaments.—P. RISSMANN (*Zentralbl. f. Gynäk.*, 1907, xxxi, 1588) sutures the round ligaments to the abdominal wall, leaving the uterus entirely fee. Three silk sutures and sometimes one or two catgut sutures in addition are passed through each round ligament at a distance of 4 to 5 cm. from the uterus. Rissmann has followed this procedure for five or six years and has not seen a relapse.

An Unusual Parovarian Tumor.—A. CZYZEWICZ, JR. (*Zentralbl. f. Gynäk.*, 1907, xxxi, 1583), states that nearly all tumors of the parovarium are unilocular, intraligamentous cysts. In a case reported by him two dermoid cysts about the size of goose eggs were removed from a woman aged forty-one years. Both tumors were inserted in the posterior layer of the broad ligament. One had its origin clearly in the ovary. The other, which was pedunculated and located between the ovary and and uterus, originated evidently from the parovarium or a supernumerary ovary. As no trace of ovarian tissue was found in the cyst or its pedicle, Czyzewicz concludes that the second tumor was a dermoid of the parovarium.

End Results in Operations for Prolapsus Uteri.—J. W. KEEFE (*Amer. Jour. Obst.*, 1907, lvi, 616) refers to the lack of unanimity of opinion as to the best method of treatment of prolapsus uteri, and then gives the results he has obtained by means of the Alexander operation of shortening the round ligaments combined with plastic surgery upon the cervix and vagina. Keefe says intra-abdominal pressure and increased weight of the uterus are important factors in the production of this condition. His experience is in 48 cases, and of these, 46 were treated by the combined methods of plastic operation on the parturient canal and the Alexander operation. Two were subjected to plastic operations first, and upon one of them the Alexander operation was done. In one of these the return of prolapse followed parturition four years subsequent to the plastic operation. The other of these two bore two children after the Alexander operation, which left her with moderate cystocele and rectocele but no prolapse. Keefe has traced 23 of the 48 cases, and in 18 of those traced the uterus is in good position and the previous symptoms are gone. In 2 of the remaining 5 cases there was a return of the prolapse to the second degree, but without any subjective symptoms. The other patient in which failure was recorded was advised to have hysterectomy done. Seven have borne children since operation, 2 of them having borne two each. Keefe's best results were in complete prolapse. Of 19 cases of this degree, he subsequently examined 12 without being able to find a complete failure in any case in which the Alexander operation was done. One failed when subjected to plastic operation alone; but after an Alexander operation was done the success was complete. Two cases had a return of the prolapse to the second degree without subjective symptoms.

Phlebitis Following Abdominal Operations.—O. G. PFAFF (*Amer. Jour. Obst.*, 1907, lvi, 630) refers to the increased coagulability of the blood late in typhoid fever and of various other interesting matters, from their etiological relation to postoperative phlebitis. Pfaff thinks many of the cases of phlebitis are simply extensive aseptic blood clots, without any true inflammation, and that one important condition in the causation of postoperative phlebitis is an abnormal plasticity of the blood. Pfaff also thinks the clot generally receives a mild form of infection introduced into the wound during the operation which later extends to the walls of the veins. Believing stagnation is a very important element in the etiology, he suggests the adoption of getting patients up early after operation, as has for years been strongly urged by Emil Ries and more recently by Boldt. Pfaff further states that the very high state of plasticity of the blood being an etiological factor, coagulability should be in every instance determined before operation and, if abnormal, be brought down to normal before the operation is done.

DERMATOLOGY.

UNDER THE CHARGE OF

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The Etiology of Impetigo Contagiosa.—BENDER (*Archiv f. Dermat. und Syphilis*, 1907, Band lxxxiv, Heft 1–3) after a careful bacteriological study of a number of cases of impetigo contagiosa, concludes that the following may be regarded as established, although the actual cause of the disease is not yet determined. (1) The ordinary staphylococci are certainly not the cause of impetigo contagiosa. (2) Streptococci are with the greatest probability to be regarded as the cause of this affection. (3) The impetigo cocci first described by Unna, are not common staphylococci; they are no nearer related to these than to streptococci.

The Etiology of Erythema Nodosum.—HILDEBRANDT (*Münch. med. Woch.*, Nr. 7, 1907) reports the case of a woman, showing signs of tuberculosis as a child, who was seized with an acute angina, stomatitis, and, after ten days, an erythema nodosum. At the acme of the attack there was a positive diazo reaction, and two guinea-pigs inoculated with venous blood of the patient intraperitoneally died of tuberculosis. The author accordingly concludes that, at the height of the erythema nodosum, virulent tubercle bacilli were present in the circulation. This patient subsequently suffered, first from a right-sided, then from a left-sided pleurisy, and later from pericarditis. The author refers to 4 other cases of erythema nodosum in which there were the signs of beginning pulmonary tuberculosis, and expresses his belief in the possibility of a form of disease being produced by the tubercle bacillus which may be distinguishable from ordinary erythema nodosum.

Carbolic Acid in Diseases of the Skin.—KROSING (*Archiv f. Dermat. und Syphilis,* Band lxxxiv, Heft 1–3) finds carbolic acid an excellent and harmless remedy in suitable diseases of the skin, being especially indicated in furunculosis and other affections due to pyogenic microorganisms. It is most useful in alcoholic solutions varying in strength from 20 to 50 per cent. Treatment with carbolic acid is not as well suited to large furuncles as to the small ones which occur upon the nape of the neck and in the anal and scrotal region, where frequently a single thorough application of a strong alcoholic solution is sufficient to cause the disappearance of the furuncles. In many cases of sycosis vulgaris repeated pencillings with a 20 per cent. to 50 per cent. solution will produce a rapid cure. In a chronic case of suppurative folliculitis of the vibrissæ the author has seen an immediate and lasting cure follow this treatment. Kerion celsi is another affection favorably influenced by this remedy. Impetigo contagiosa is quickly cured by applications of carbolic acid, but reddening and pigmentation are apt to remain for a longer time after such treatment than after the employment of other remedies; for the same reason the author has given up its employment in acne.

A Special Form of Trichophytosis as a Sequel of the Permanent Bath.—JACOBI (*Archiv f. Dermat. und Syphilis,* Band lxxxiv, Heft 1–3) describes an unusual form of dermatomycosis observed in patients treated by the permanent bath, the majority of the cases occurring in the psychiatric clinic at Freiburg. The affection began usually, but not always, in the region of the genitalia, frequenty also in the axillæ, as dark red, slightly infiltrated papules, which scattered about in great numbers, spread over a great part of the body, involving finally all parts covered permanently by the water. The face also showed single plaques, but only on the side which was mostly under water. In highly developed cases the palms and soles were affected, but it was never seen to attack the hair nor nails. There was neither itching nor pain. In large patches three zones could be distinguished. A very slightly elevated, bright-red border; a dark-red, livid centre, and between the two a narrow ring of thickened, whitish, opaque epidermis. In the whitish accumulations of epidermis an enormous quantity of mycelial threads could be demonstrated which were double-contoured, shining, interlaced, and branched, homogeneous, and without septa. The author concludes that this form of trichophytosis is produced by a germ normally present in the bath water which finds in the greatly macerated epidermis of cachectic individuals conditions favorable to producing a mild degree of virulence, a virulence which is completely lost upon drying.

A Case of Paget's Disease Treated by the X-rays.—G. W. Dawson (*Brit. Jour. of Dermatology*, June, 1907), at the April meeting of the Dermatological Society of Great Britian and Ireland, presented a case of Paget's disease of the breast in a woman, seventy-nine years old, who for six months had been submitted to *x*-ray treatment. The treatment had produced a very manifest improvement.

Healing of a Carcinoma by Sunlight.—Widmer (*Münch. med. Woch.*, 1907, Nr. 13) reports a case of carcinoma of the back of the right hand accompanied by painful swelling of the neighboring glands, occurring in a woman eighty-one years old, in which healing was obtained by exposure for a prolonged period to the rays of the sun. Exposures four hours long were made almost daily for three months. The author has likewise seen healing follow this method of treatment in an unusually short time in ulcers due to frostbite, chronic leg ulcers, chronic fistulæ following suppuration of the glands of the neck, eczema, bed-sore, and herpes tonsurans. The reflected rays are regarded as especially therapeutically active.

PATHOLOGY AND BACTERIOLOGY.

UNDER THE CHARGE OF
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ASSISTED BY
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Observations upon Paroxysmal Hemoglobinuria.—In previous papers Donath and Landsteiner have shown that the blood serum of patients suffering with paroxysmal hemoglobinuria contains, during the attack, a substance which unites with the red blood corpuscles at low temperatures and on subsequent heating at 37° C. in contact with normal serum causes their hemolysis. These observations have been confirmed by others. Widal and Rostaine have offered an explanation for the phenomenon which differs from that of Donath and Landsteiner. They consider that the normal serum contains an antihemolysin which, in cases of paroxysmal hemoglobinuria, is diminished in amount and therefore allows auto- or iso-hemolysis to take place. DONATH and LANDSTEINER (*Cent. f. Bakt. und Parasitknd.*, 1907, xlv, 205) now find that the antihemolytic action of the normal heated serum is no greater than that of the serum from cases of paroxysmal hemoglobinuria.

It was further shown that in some rabbits the blood serum had the same property of making the red blood corpuscles, when brought in contact with them at low temperatures, susceptible to hemolysis by small amounts of normal guinea-pig's serum at 37° C.

They therefore conclude that their original supposition was correct. Since 3 of 5 of their cases of paroxysmal hemoglobinuria gave a history of syphilis, the authors suggest that this toxic autolytic substance may in some way be produced by a syphilitic infection.

CHOROSCHILOW (*Zeit. f. Klin. Med.*, 1907, lxiv, 431) too, in a short series of experiments in one case of paroxysmal hemoglobinuria, has not been able to confirm the opinion which Widal and Rostaine expressed. In two cases which Choroschilow studied, he performed the following experiments: The fingers of one hand of the patient were kept for several minutes in ice cold water. Then blood was drawn from the chilled fingers, and for control from the fingers of the hand which had remained at room temperature. When the blood from the chilled fingers clotted the serum which separated out was seen to be quite deeply tinged with hemoglobin. The serum above the clotted blood taken from the fingers of the other hand, although showing some hemoglobin, was never so deeply colored. Control experiments carried out in the same manner with normal individuals never gave the same results. The serum was not discolored. He found, however, when the blood from the cases of hemoglobinuria was prevented from clotting, that visible hemolysis did not occur and the supernatent plasma remained free from hemoglobin. Choroschilow believes that the red blood corpuscles of the cases of paroxysmal hemoglobinuria are easily injured by low temperatures, but hemolysis does not take place in the peripheral circulation and the injured red cells are not freed of their hemoglobin until they reach the kidney.

Polyarteritis Acuta Nodosa and Peri-arteritis Nodosa.—CARNEGIE DICKSON (*Jour. Path. and Bact.*, 1907, xii, 31) believes that under the name "peri-arteritis nodosa" two distinct diseases have been described; a true peri-arteritis, nodular in its distribution and usually due to syphilis, a condition for which he would restrict the term peri-arteritis nodosa, and a second disease in which all the coats of the vessels are affected and which is characterized by the formation upon the smaller and medium-sized arteries of small localized nodules, polyarteritis acuta nodosa. This latter condition is exceedingly rare and Dickson has only been able to find 18 reported cases. He describes in detail a case of this latter type occurring in a boy, aged fourteen years. The disease started with severe abdominal pain, later the patient developed symptoms suggesting meningitis, and, finally, died after an illness of ten weeks. At the autopsy small nodules were found upon the small vessels of the mesentery, heart, liver, spleen, kidneys, brain, and spinal cord. There was subacute nephritis with infractions of the kidneys and lungs, and hemorrhage from rupture of small aneurysms of vessels upon the surface of the brain. Histological examination of the nodular formations upon the arteries showed that they were in almost all cases small aneurysmal dilatations of the vessel wall, sometimes involving the entire circumference of the vessel, sometimes involving only one portion of the wall. The formation of these aneurysms could be followed in the smallest and earliest nodules. The first changes occurred in the muscular coat, and were of a degenerative and inflammatory nature; later the elastic lamina appeared broken and fragmented. Following upon this came the aneurysmal dilatation with proliferative changes in the intima, frequent thrombosis of the vessel lumen, and inflammatory changes in the outer coat. Giant cells were often seen near the fragmented elastic lamina. The etiology of the condition (which is very obscure) could not be elucidated by a study of this case. No bacteria, including the tubercle bacillus, could be found in the tissue, and the stains for Spirochæta pallida gave negative result. Dickson, nevertheless, believes that the condition is caused by some bacterial or other infective organism or its toxin. Since the vasa vasorum of the diseased vessels showed some alterations, Dickson thinks it possible that the infection reaches the vessel wall either through this route or by means of the perivascular lymphatics.

Action of Magnesium Salts on the Peripheral Motor Nervous System.—The interesting experiments which Meltzer and Auer have performed regarding the action of magnesium sulphate and the results which they have obtained following the subcutaneous and intraspinal injections of this salt, raise many questions regarding the physiological action of the drug upon the nervous system. Barbier (*Jour. de Phys., et de Path. Gen.*, 1907, ix, 611) has made some experiments by means of the ergograph to determine what action the injection of magnesium salts has upon the nervous system of the frog. He finds that after such injections, the muscle responds to excitations of the nerves of the leg in an irregular manner, producing a curve which is typical, according to Mosso and others, of curves obtained with the use of poisons acting after the manner of curare. The magnesium salts affect only the motor endings of the nerves, for the muscle reacts perfectly to electrical stimuli. The ergographic curves show the progress of the intoxication which ends in complete paralysis of the motor nerve terminals.

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ORIGINAL ARTICLES.

AN ANALYSIS OF ONE HUNDRED AND FORTY OPERATIONS ON THE KIDNEYS AND URETERS.[1]

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In response to the kind invitation of your president, I shall present for your consideration and discussion, this evening, a few facts gleaned from a brief and rather incomplete analysis of 140 operations on the kidneys and ureters. My reason for selecting this subject is twofold: first, my own personal interest in renal and ureteral work, and second, the fact that in looking over my renal histories I find a larger proportion of mistakes in diagnosis recorded than in any other group of operative cases. For this reason I have been in the habit, more or less frequently, of reviewing my case histories in an attempt to find data which would enable me to lessen the number of my diagnostic errors. Three years ago I made a careful analysis of all of my cases and presented a report of them to the Section on Surgery of the Academy of Medicine. Since that report I have had an opportunity of studying 56 additional cases, and it has occurred to me that a review of these and my previous cases might prove of interest.

Of the 140 cases, there were 48 nephrectomies with two deaths, 48 nephrotomies and exploratory operations with 9 deaths, 13 simple decapsulations with 2 deaths, 9 emergency operations on traumatic lesions with 1 death, 15 nephrorrhaphies and 9 operations on the lower ureter without mortality.

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[1] Read at a meeting of the Section on Surgery of the New York Academy of Medicine, January 11, 1908.

The following are the pathological lesions found, many of the cases presenting two or more lesions: In the 48 nephrectomies there were 6 cases of new growth, 7 cases of tuberculosis, 18 cases of pyonephrosis, 17 cases of calculus, 3 cases of traumatic rupture, 8 cases of acute septic infarcts, 3 cases of hydronephrosis, 2 cases of ureterovaginal fistula following hysterectomy, 1 case of septic pyelonephritis, 1 case of severe hemorrhage following nephrotomy, and 1 case of necrosis of the organ from a twisted pedicle.

Of the 48 nephrotomies and exploratory incisions, there were 3 cases of newgrowth, 6 cases of pyonephrosis, 11 cases of calculus, 2 cases of tuberculosis, 14 cases of septic infarcts, 4 cases of intermittent hydronephrosis, 2 cases of pyelonephritis, 2 cases of polycystic kidney, 1 case of large cortical abscess, and in 5 instances the exploratory incision revealed no lesion. While decapsulation was frequently practised in acute septic and other conditions, in connection with other operative procedures, in 13 instances it was the only operation. Of the 13 simple decapsulations, in 5 patients the double operation was performed for chronic nephritis, in 1 instance single decapsulation was performed for a long-standing renal neuralgia of unknown origin, and in several others it was undertaken for the relief of subacute septic infarcts.

The 16 nephrorrhaphies were all for the relief of movable kidney. In 6 of these, positive signs of an intermittent hydronephrosis were obtained prior to operation. In all the others there were distinct renal symptoms, varying in severity from slight but frequently recurring discomfort to characteristic Dietl's crises.

Of the 9 operations on traumatic cases, 7 revealed evidences of injury to the kidney varying from slight capsular rupture to complete crushing. In two instances a rupture of one or more of the larger branches of the renal vein was present.

Of the 9 operations on the lower portion of the ureter, in 4 arrested calculi were found, in 2 the ureter was kinked by an inflammatory mass, in 1 there was an adherent calcified appendix epiploica of the sigmoid, giving rise to an x-ray shadow, while in 2 the ureter was found to be normal.

FATAL CASES. It may be instructive first to analyze the 14 fatal cases of the series. In my first report of 84 cases, 12, or 14.2 per cent., proved fatal, while in my last series of 56 cases only 2, or 3.7 per cent., died as a result of operation.

In the 48 nephrectomies there were 2 deaths. The first of these occurred in a middle-aged man upon whom nephrotomy was performed for the removal of multiple calculi of the pelvis. There was considerable laceration of the renal tissue in the removal of the four stones, giving rise to a severe hemorrhage, which was only controlled by generous gauze packing. Four hours later the hemorrhage recurred. I was summoned and performed a hasty nephrectomy on a moribund patient. Although the removal of the kidney was accomplished without more than a trifling loss of blood, and although the patient received a large intravenous infusion of normal salt solution and was otherwise stimulated, he never rallied, and died at the end of four days from suppression of urine and œdema of the lungs. Autopsy revealed chronic left-sided pyelonephritis and several calculi that had not been revealed by the *x*-rays. While the case was an unfavorable one, had the nephrectomy been performed at the primary operation while the condition of the patient was still good, recovery might have taken place. The procedure followed was undoubtedly an error of judgment on my part.

The other death occurred in a feeble and profoundly prostrated girl, who had been suffering for weeks from pain, vomiting, and septic intoxication. She had a movable tuberculous kidney, which had become adherent in the pelvic cavity, and had acquired a mixed infection. The operation was an exceedingly difficult one, and was accompanied and followed by profound shock, which did not respond to active stimulating measures. I cannot blame myself for this fatality, as the difficulty in the operation consisted in exposing the kidney; it would scarcely have been less if only drainage had been employed, and it is exceedingly doubtful if simple drainage would have sufficiently relieved the grave toxemia to allow a secondary nephrectomy had she survived the primary operation.

Of the 8 deaths which occurred in the nephrotomy cases, I can severely blame my judgment in but one instance. This was the case of a man, aged seventy-one years, in poor general condition, who for four years had suffered symptoms suggesting stone in the right kidney. There were frequently recurring attacks of renal neuralgia, with the passage of dark colored urine. There was marked tenderness in the right costovertebral angle. Cystoscopy showed urine from both ureteral orifices. The urine at the time of examination did not contain blood. No *x*-ray examination was made. The kidney was explored by the lumbar route, its cortex incised, and no lesion found. Infection followed, and the patient succumbed five weeks later to general sepsis. There were 4 fatal cases of acute septic infarcts, which were treated by nephrotomy and drainage. These were among my earlier cases, when I believed the lesion to be bilateral. At present I am convinced all might have been saved by an early nephrectomy. They will be discussed more at length later in the paper. In a sixth case in which nephrotomy was performed for stricture of the upper ureter death resulted from pneumonia.

The seventh death in this series occurred in the case of a young woman, aged twenty-four years, who had suffered for years from left-sided renal tuberculosis. Several weeks before admission septic infection occurred and resulted in a mixed pyonephrosis. At operation the kidney was found distended with pus, the cortex being studded with innumerable tuberculous foci. The operation consisted simply in incising and draining the pus cavity. She died four days later from uremia.

The eighth death of this series occurred in a profoundly septic woman with a perinephritic abscess, the result of a neglected unilateral blood infection (septic infarcts). The history of this case will be reported in detail later in the paper.

The ninth death in this series, and the only death which occurred from a simple exploratory incision, was in a case of huge inoperable malignant tumor of the right kidney. The patient was a man, aged fifty-one years, who had suffered from symptoms of renal growth for eight months and was markedly prostrated by repeated hemorrhages. On exposing the tumor by a large König incision, it was found to be highly vascular and its surface covered by large adherent veins. The pedicle was so short that it could not be safely ligated. The operation was therefore abandoned. The patient never rallied from the exploration, which was the immediate cause of death. In all probability he would have lived several weeks longer if he had not been subjected to operation.

The only death which occurred in my series of traumatic cases was that of a man who had received a heavy blow on the right side, resulting in a complete rupture of the kidney and a fracture of the liver with extensive intra- and extraperitoneal hemorrhage. At operation the abdomen was first opened and the liver hemorrhage checked. The renal region was next explored, but the condition of the patient would not permit further operative procedures other than gauze packing. He died in a few hours of shock and loss of blood.

The two deaths which occurred as a result of double decapsulations were both cases of advanced chronic nephritis. In both instances death resulted from an increase in the uremic symptoms. There was no local infection.

Decapsulation in Nephritis. While I have never seen a cure result from decapsulation in chronic afebrile nephritis, I have observed marked improvement in two instances. The first was that of a middle-aged man who was admitted to the City Hospital suffering from mild symptoms of uremia, probably accentuated by a recent alcoholic debauch. The urine contained a fairly large percentage of albumin with granular and hyaline casts. After double decapsulation the albumin diminished and the granular casts disappeared. His general condition improved greatly, and he was discharged in excellent condition. He was watched for several years by a member of my house staff, who made frequent examinations of the urine. He was able to continue his occupation as a worker in the city morgue, and only had a recurrence of his symptoms after indulgence in alcohol.

The second case was that of a boy, aged eight years. For four months he had suffered from headaches, œdema of the face and legs, and ascites. He had been repeatedly tapped, and the legs had been incised for the œdema. The urine showed the signs of a diffuse nephritis. After double decapsulation all the symptoms improved rapidly. The œdema disappeared, the ascites diminished, the headaches cleared, and his general health improved. The change was so striking, occurred so promptly after the operation, and presented such a marked contrast to the progressive deterioration of health before operation while under medical treatment, that it convinced me that in this case at least the operation had been of decided benefit to the patient.

My experience with decapsulation in acute cases, particularly in cases of subacute septic infarcts, has convinced me that it is of great value. A rather striking example of an effect of this kind is the following: The case was that of a married woman, aged twenty-three years, who was admitted to the Roosevelt Hospital with a diagnosis of renal calculus. Seven weeks before admission she experienced a severe pain in the right loin, radiating to the groin and thigh. This pain continued for one to two hours and then subsided. Following the paroxysm of pain she had a severe chill, with fever and vomiting, which lasted for two days. During this period the temperature reached 103° F. Since the acute attack the patient had complained of more or less constant pain and discomfort in the region of the right kidney and ureter, with occasional attacks of a more acute nature.

On admission to the hospital she seemed weak and anemic. Her temperature was 100° F., pulse, 120; and the blood count showed 10,000 leukocytes, 56 per cent. polynuclears. Physical examination revealed tenderness in the right costovertebral angle, and along the course of the ureter to the pelvic brim. On cystoscopic examination the bladder appeared normal. There was, however, no efflux from the right ureteral orifice, but an abundant flow from the left. Both ureters were catheterized. From the left there was an abundant flow of normal urine; from the right only a few drops were obtained after forty-five minutes. *X*-ray examination was negative. From these findings a diagnosis of subacute infarcts was made, and an operation was advised.

Under ether anesthesia, the right kidney was explored by lumbar incision. The fatty capsule was somewhat adherent. The surface of the organ was studded with small, whitish areas which were moderately indurated. No calculus was felt. The fibrous capsule was stripped from the organ, the kidney replaced, and the wound sutured. There was a moderate febrile reaction following the operation, which subsided on the seventh day. The wound healed by primary union. All sutures were removed on the tenth day. Fourteen days after operation she was again cystoscoped and the ureters catheterized. From both catheters there was an abundant flow, 12 c.c. from the right and 15 c.c. from the left in twenty minutes.

Although the urine from the right side showed a very faint trace of albumin, its percentage of urea was higher than that from the left, showing that its function had been practically restored.

NEWGROWTHS. Twelve cases of newgrowth were encountered in this series. Of these, 3 were carcinomas, 2 hypernephromas, and 1 adenoma; 2 were cases of solitary cysts, 3 of polycystic kidney, and in one no accurate diagnosis could be made, although the history suggested a rapidly growing hypernephroma.

Of the cases of carcinoma, one developed in a man aged thirty-three years. The kidney was removed. The pathological diagnosis was adenocarcinoma involving one-half of the organ but not perforating the capsule. He is now well, seven years and eight months after operation.

The second case was one of epithelioma of the pelvis, which also contained a large branching stone. The growth had extended beyond the capsule and involved the renal vein. The patient was a feeble, elderly woman over sixty. She recovered from the nephrectomy, but died shortly after of general metastasis.

A third case occurred in a retired naval officer aged fifty-nine years. A small carcinomatous nodule was found in the upper half of the right kideny. He recovered from a nephrectomy and remained well for about a year, after which he gradually failed and died, probably of visceral metastasis.

Of the two cases of hypernephroma, one occurred in a woman aged forty-one years, with a history of left-sided pain and hematuria for eight years. On examination a large nodular tumor was felt in the left kidney region, which was freely movable and not tender to pressure. Nephrectomy was followed by prompt recovery.

The second occurred in a woman aged sixty-nine years, who also suffered from grave valvular disease of the heart. The tumor had evidently existed for a long period before characteristic symptoms appeared. Ten days before operation she experienced severe pain, chills, and fever. A large renal tumor was present, and was markedly tender to the touch. There were found also two hard glandular masses in the neck, but no sign of lymph-node involvement elsewhere in the body. At operation three pathological conditions were found—a large hypernephroma involving nearly one-half of the organ, a septic pyonephrosis, and a conical calculus plugging the ureter. She recovered from the operation, the wound healing kindly, and for several weeks was free from pain and discomfort. Later she developed signs of a rapidly progressive cachexia, and died about two months after the operation.

The case of adenoma occurred in a woman aged forty-six years, who for two years or more had suffered from attacks of left-sided abdominal pain, with dark colored urine. These attacks were repeated at frequent intervals, and were often accompanied by vomiting and fever. On palpation a moderate sized movable kidney was found. An exploratory incision was made, and an oval, apparently encapsulated tumor was found on the anterior surface of the kidney. This was enucleated and the kidney decapsulated. The pathological report was adenoma. Two weeks later the kidney was removed, and she made an uninterrupted recovery.

Of the two solitary cysts, one was of moderate size, thin walled, translucent, growing from the anterior surface of the right kidney; the other was of enormous size, thick walled, and filled with pus, probably an echinococcus cyst, which had suppurated. In the former case the cyst was enucleated, in the latter the kidney was removed. Both patients made satisfactory recoveries.

Of the three cases of polycystic kidney, one was double and inoperable. The patient was sent to the hospital as a possible case of ectopic gestation. The history was that of a rapidly growing painful tumor following a sudden cessation of menstruation. The woman was obese, and only the lower portion of the right kidney tumor could be palpated in the inguinal region. Operation revealed two enormous polycystic kidneys, which were not disturbed.

The second was that of a rapidly developing tuberculosis of a moderate sized polycystic left kidney. Its removal was followed by prompt recovery. In the third case a polycystic right kidney was found to be the seat of multiple acute septic infarcts. The patient was sent to the hospital with a diagnosis of acute appendicitis. She recovered promptly after decapsulation.

The last of the new-growth cases was that of the fatal exploration on an inoperable malignant growth already referred to in the early part of this report.

TUBERCULOSIS. Nine cases of primary tuberculosis of the kidney were operated upon. Of these, 4 were early cases, the lesions being multiple and small, and 5 were late, there being in addition a tuberculous or mixed pyonephrosis.

Two of these, one early and one late case, were operated upon by nephrotomy and drainage. Both of them occurred early in my experience, and both patients died within two weeks of the operation. The reason why these kidneys were not removed was that in one, the early case, I believed from the history that the condition was septic and bilateral. In the second, a late case, I believed that the condition of the patient would not warrant a nephrectomy. I am now convinced that my judgment was defective in both instances. Seven cases were subjected to nephrectomy, and of these, 6 recovered, and when last heard from 5 were in good or improving condition, 1 having died two years after operation from general tuberculosis.

CALCULUS. The group of calculus cases furnishes an interesting series. In my former report, being impressed with the number of errors which occurred in the diagnosis of stone, I made a careful analysis of 36 cases in which the histories led us strongly to suspect the presence of a calculus in the kidney or ureter. In 21 cases, or 59 per cent., only did the operation confirm the diagnosis. With a view to finding out if possible the *reason* for this large percentage of error, I made a chart recording the presence *or* absence of all the chief symptoms or signs generally encountered in calculus cases, and compared the grouping of these symptoms in the two classes.

As a result of this study it was hoped that the errors during the last three years would have been less glaring, but on reviewing our records it is found that in only 52.6 per cent. of our recent cases of suspected calculus did the operation prove our diagnosis correct. The number of errors is discouraging, and it may not be a waste of time to apply the same analysis to the recent series of cases and by combining the two groups attempt to throw some additional light on the subject.

The number of cases which in their onset, early symptoms, and subsequent history led us to believe stone to be present in the kidney or ureter were 57. Of these, in 32 instances stone was found at operation, in 19 no stone was found, but some other definite lesion which furnished a reasonable cause for the existence of the symptoms, while in 6 no lesion was found.

Let us therefore consider for a moment: (1) The subjective symptom, pain; (2) the objective symptoms, as frequent and painful micturition, vomiting, fever, localized tenderness, and the presence of a renal tumor; (3) the results of urinary analysis with reference to hematuria and pyuria; (4) the results of *x*-ray examination; and (5) the results of cystoscopy and ureteral catheterization.

Pain is, perhaps, the most constant and characteristic symptom of renal stone. It was present in some form in 31 of the 32 cases in which stone was found at operation. Its absence was not recorded in a single instance, but the history is defective in 1 case. Regarding the character of the pain, it is somewhat difficult to classify the cases, as it frequently changed during the progress of the disease. I have therefore made four classes indicating the type most prominently present in each case: (1) Severe paroxysmal pain, radiating downward from the kidney along the course of the ureter, the typical renal colic; (2) mild paroxysmal pain, radiating less constantly downward; (3) severe constant pain; (4) mild constant pain or discomfort. Of the 32 cases in which stone was found, 19 had severe paroxysmal pain, or typical renal colic, 4 had mild paroxysmal pain, 2 had severe constant pain, 6 had only mild constant pain. In 3 of the 19 cases having severe paroxysmal pain, it began in the epigastric region, shifted later to the region of the kidney, and continued thereafter in that location.

Of the 6 cases complaining only of mild constant pain, 1 had an open sinus from a previous nephrotomy leading to a pelvis full of stones, and the seat of a purulent inflammation, 3 were profoundly septic, and 1 had a soft stone completely filling the pelvis.

The point of greatest intensity of the pain was not infrequently located somewhat below the kidney, in several instances at or near McBurney's point on the right side, or at a corresponding point on the left. This was particularly the case in a patient with a stone which frequently became impacted in the upper portion of the ureter and was found there at operation; also in another case in which a small stone was found in a calyx at the upper pole of the kidney. Both of these cases had been subjected to operation for the removal of the appendix. In a third patient, who also underwent the operation of appendectomy, the cause of the inguinal pain was found to be a stone arrested in the lower ureter near the bladder.

In 3 other cases of stone arrested in the lower ureter, the point of greatest pain and tenderness lay below McBurney's point, about one inch above the external abdominal ring. In 2 cases of stone in the lower ureter (both females) there had been a numbness at times of the labium on the side corresponding with the lesion. In 1 case of stone in the lower ureter, there was a constant pain near the umbilicus, with occasional attacks of acute paroxysmal pain in the kidney.

Of the 25 cases in which no stone was found at operation, 10 had severe paroxysmal pain, 1 mild paroxysmal pain, 8 severe constant pain, 3 mild constant pain, while in 3 the history is defective. Of the 10 cases with typical renal colic, 1 had an intermittent hydronephrosis from movable kidney, 1 a chronic interstitial nephritis, 4 had septic infarcts, 1 an adenoma, 1 a periureteral exudate, while 2 presented no discoverable lesions of the kidney or ureter. In addition to characteristic and unusually severe renal colic, these 2 patients also had vomiting and blood in the urine. The cystoscope showed in each instance an œdematous and everted ureteral meatus, into which a catheter could not be made to enter. The *x*-rays in 1 case showed a dimly defined shadow over the lower ureter, in the other no shadow in 3 exposures.

Of the other patients, 1 with mild paroxysmal pain had a perinephritic abscess. The *x*-rays in this case led us astray by showing a distinct though ill-defined shadow in the renal region (only one exposure), 3 patients with severe constant pain showed no lesion of the kidney, 4 had suppurative disease of the kidney, and 1 had a chronic diffuse nephritis with intermittent hematuria coming from the ureter corresponding with the painful and tender kidney.

One case with mild constant pain, which was located over the lower ureter, showed on *x*-ray examination a distinct shadow in the pelvis. Operation revealed the presence of a large calcareous body adherent to but outside the ureter, near the bladder; 2 others with mild constant pain over the ureter, and with *x*-ray shadows, proved negative on exploration.

Vomiting was found to be a very constant accompaniment of severe colic. Of the 32 cases in which stone was found, 12 had vomiting, 15 had no vomiting, and in 5 the history was defective. Of the

25 cases in which no stone was found, vomiting occurred in 13, was absent in 6, and unrecorded in 6 cases. That it is not a very reliable symptom of calculus will be appreciated when we observe that it occurred in a greater percentage of the cases in which no stone was found.

The combination of severe vomiting and violent epigastric pain is misleading, and in my experience has once led to an unnecessary laparotomy. Severe colic is less likely to be accompanied by vomiting when the stone is in the lower ureter than when the lesion is in the upper ureter or kidney.

Frequent or painful micturition, occasionally associated with severe tenesmus, was present in 20 of the 32 cases of stone; it was absent in 9 and unrecorded in 3. In the cases without stone it was present in 8, absent in 9, and unrecorded in 8 cases. Of 6 cases of stone in the ureter, this symptom was constantly present.

Fever is rarely a symptom of uncomplicated stone in the kidney or ureter, but is frequently present when infection is added. It was present in 13 cases, absent in 17, and unrecorded in 2. Of the 13 cases in which it was present, all had pyuria or other evidences of septic infection.

Mild and even moderately severe cases of calculus pyelitis often exhibit a normal temperature while the ureter remains patent, but show an immediate rise in temperature if for any reason the ureter becomes occluded. This occurred in 4 cases of my series, in 2 of which the stone became impacted in the upper part of the ureter, and in 2 others the stone was arrested low down in that canal, and temporary occlusion was probably caused by some change in its position.

Of the 25 cases in which no stone was found, fever was present in 9, absent in 9, and unrecorded in 7. In this group also fever was present only when infection was known to exist.

Tenderness was present in every case of stone in which the history was preserved; thus in 31 of the 32 cases its presence is recorded. In 26 cases it was present in the region of the kidney, best elicited by bimanual papation or by firm pressure in the costovertebral angle. In one instance the tenderness existed over the ureter, the stone being subsequently found in the kidney; in another the tenderness was chiefly over the kidney, the stone being found in the lower end of the ureter. In 3 cases of stone in the lower ureter, tenderness was most marked from one to two inches above the external abdominal ring, while in 1 it was at the brim of the pelvis.

Of the 24 cases in which no stone was found, 16 had renal tenderness, while in the remaining 8 the records do not mention it.

As tenderness is generally present when severe spontaneous pain is felt, and as in at least 6 cases of this series which showed no stone or inflammatory lesion marked tenderness existed, too much reliance must not be placed on this symptom.

Renal Tumor. In only 14 of the 32 stone cases could the kidney be palpated, while in 17 it could not be felt, 1 case being without a record. In 4 only of the negative cases was the kidney palpated, 1 of these being an intermittent hydronephrosis, and 1 a large pyonephrosis. In the remaining 21 this sign was either absent or unrecorded.

While the presence of an enlarged and tender renal tumor must be regarded as almost positive evidence of some lesion of that organ, the absence of this sign should not militate against the diagnosis of stone, as it is rarely encountered in uncomplicated cases of renal calculus.

Hematuria. While blood is probably present in the urine at some period in nearly every case of renal or ureteral stone, it is often in such small amount as to be detected only by the microscope; moreover it is often entirely absent at the time of a given examination. Of my 32 stone cases, 16 had blood in the urine, 14 had none, and in 2 the history is defective. Of the 16 cases in which blood was found, in 7 it colored the urine so that it was noticed by the patient, and in 9 it was found only by the microscope.

Of the 25 cases in whch no stone was found, 11 had hematuria, 9 had no blood, and in 5 it is not recorded. Of the 11 cases of hematuria in which stone was not found, in 9 the blood was seen only by the microscope; in 1 it was seen by the cystoscope, issuing in a long worm-like clot from the ureter; in the remaining case, in which the hemorrhage was abundant, the lesion proved to be chronic hemorrhagic nephritis. Of the 9 cases in which microscopic blood was found, 1 was an acute pyelonephritis, 1 a pyonephrosis and cortical abscess, 3 septic infarcts (2 acute and 1 chronic), 1 an adenoma, 1 a periureteral exudate, and 1 showed no lesion at operation, although there is much reason to suspect that in this, as well as in the case in which blood was seen by the cystoscope issuing from the ureter, a stone was present in the ureter and passed just before operation.

In calculus cases, one is apt to find traces of blood during or immediately after a paroxysm of colic. In one instance, after watching for several weeks a patient who complained of severe attacks of paroxysmal pain and vomiting, the pain being referred to an area about the size of a silver quarter, one inch to the inner side of McBurney's point, I was able to make a correct diagnosis by observing a few red blood cells in a specimen of urine passed immediately after a paroxysm. This led me to make a second exploration of the kidney (the first exploration having been performed by another surgeon several months before). At the second nephrotomy, a small calculus was found completely plugging the pelvic extremity of the ureter.

Pyuria. The presence of pus in the urine is dependent upon so many factors that it is of very little value in the diagnosis of renal or ureteral stone.

The presence of a stone in the uninfected pelvis of a kidney or ureter does not give rise to a purulent secretion. That the pus is often due to infection is evidenced by the fact that in 26 of our 32 stone cases pyuria was noted, in 4 it was absent, and in 2 it was unrecorded. It was also present in 7 cases in which stone was not found.

The presence of pus in the urine from one kidney and its absence from that drawn from the other by ureteral catheterization is, of course, a valuable sign of renal infection, and, with other confirmatory evidence, is often of value in determining the presence or absence of stone.

Cystoscopy and ureteral catheterization were employed in 36 cases of this series, *radiography* in 35. The reason why these aids to diagnosis were not employed in a larger percentage of the cases is that it is only within the last five or six years that our hospital facilities permitted their regular use. Moreover, not a few of these cases were seen and operated upon in the country where these aids were not available.

The cystoscope enables us to note the condition of the mucous membrane of the bladder, the appearance of the ureteral orifices, the efflux, and to a certain extent the character of the urine excreted from each kidney. The ureteral catheter enables us to discover any ureteral obstruction and to obtain the separate urines; positive diagnosis of stone can be made by the cystoscope only when the calculus can be seen protruding from the ureteral orifice; positive diagnosis with the ureteral catheter only in the female, when the stone lies low down in the ureter and can be touched with a metal catheter or bougie. The presence of an œdematous ureteral meatus suggests stone. When there is, in addition, pouting or eversion of the meatus, we suspect stone low down in the ureter. If obstruction is also encountered, the suspicion of stone is increased to a probability.

The presence of blood and pus from a kidney which has been the seat of an afebrile colic is confirmatory evidence of value, but by no means conclusive.

In twenty cystoscopic examinations in cases in which stone was found at operation, the meatal appearances and catheter findings suggested or tended to confirm the diagnosis in 11 instances, and were of no value in 9. In 16 cystoscopic examinations in cases of suspected stone in which no stone was found at operation, in 5 the findings were confirmatory of calculus, in 8 they indicated renal lesions, but not necessarily stone, in 1 the examination was negative, and in 2 the records were lost.

Regarding the results of our x-ray studies I can speak with much more confidence. In the 32 cases in which stone was found at operation 20 x-ray examinations are recorded, in which 18 were positive and 2 negative, both of the latter being in exceedingly corpulent individuals. In no instance during the past three years has an *x*-ray plate failed to reveal a shadow when stone was found at operation. Of the 25 cases of suspected stone in which no stone was found at operation, in 15 radiographic findings are recorded. Of these, 9 showed no shadow, while 6 showed a shadow which was thought to be calculous. Of the 6 errors, 5 occurred over the region of the ureter and 1 over the kidney. Two of the shadows had not clearly defined edges, one over the kidney and one corresponding with the pelvic portion of the ureter. One very clearly defined shadow over the pelvic portion of the left ureter was found at operation to be a calcified appendix epiploica adherent to the peritoneum overlying the ureter.

In three other instances shadows were found near the tip of the transverse process of the fourth lumbar vertebra; on the right side twice, on the left once. In these three instances exploration proved negative. In one the shadow was thought to be due to calcification of a broken-down lymph node from a previous appendicitis, as the ureter was kinked by a dense band of inflammatory tissue.

If we follow the advice of Dr. Cole, and reject all plates which do not show the structure of the bone, the outline of the psoas muscle, and the transverse processes of the lumbar vertebræ, and look with suspicion on all shadows which do not have well defined edges, only four errors would be recorded in this series of cases.

Several sources of error must be considered in plates of the pelvic cavity, namely: calcified lymph nodes, phleboliths, calcareous masses in the sacrosciatic ligament, and calcified appendices epiploicæ, which have not to my knowledge been observed before.

If we include all cases examined, the *x*-rays gave positive evidence of the presence or absence of stone in 79 per cent. of our cases. If we exclude the imperfect plates and those in which the edges of the shadow were not distinctly defined, it gave accurate indications in 91 per cent. of the cases examined. If in addition we exclude the ureter plates, the results would be accurate in every instance, and we must therefore regard it as the most reliable means of examination which we possess.

Ureteral catheterization proved valuable in confirming our diagnosis, in definitely determining the side of the lesion, and in estimating the competence of the opposite kidney. It has been of positive value in certain instances by enabling the surgeon to touch a ureteral stone with a metal catheter or bougie in the female. It has also been useful with the *x*-rays, by introducing a catheter bearing a metal stylet into the ureter, to determine the probability of a given shadow being within or without the canal, although this might lead to error if the object causing the shadow lay in front or just behind the ureter, as in my case in which a calcified appendix epiploica lay just in front of the terminal portion of the ureter.

From a careful review of the above facts, I feel justified in stating that there is no single symptom or sign, nor any group of symptoms or signs, that is absolutely pathognomonic of renal or ureteral calculus, unless the calculus lies in the lower ureter and can be seen or touched by a metal bougie or catheter.

The most important factors to be considered in making a diagnosis are pain, tenderness, hematuria, the results of radiography, cystoscopy, and ureteral catheterization. While vomiting, vesical irritability, pyuria, fever, and the presence or absence of a renal tumor are important, and will often help us to confirm or lead us to exclude other pathological conditions, too much reliance must not be placed upon them in the diagnosis of calculus. While pain and tenderness were present in practically 100 per cent. of our cases of stone, it must not be forgotten that they were also present in a large percentage of the cases in which no stone was found. That calculus may, and often does, exist without pain is evidenced by the statement of Bruce Clark, who reported 24 autopsies upon calculous patients, in 13 of which there had been no subjective symptoms during life. Hematuria was known to be present in 45 per cent. of our stone cases, but it was also present in 41 per cent. of the cases without stone. Spontaneous hemorrhage occurring during rest and sleep generally means newgrowth. Hemorrhage following active exercise or jolting, and accompanied by characteristic colic, in the absence of other demonstrable pathological conditions, is strongly suggestive of calculus.

In this connection it may be interesting to note that on five occasions I have observed calculus disease in both kidneys:

Case I.—Female child. Small calculus removed from right kidney. Well for six years, then symptoms on the left side. *X*-rays positive. Stone size of a cherry removed from pelvis of the left kidney. Recovery.

Case II.—Male, aged forty years. Kidney pain for twenty years, pyonephrosis right. Kidney incised and drained, stone removed. Later, pyonephrosis of the left, opened and drained, stone impacted in left ureter. Both sinuses remain open. Later, *x*-rays show stone in bladder and in lower end of both ureters. Bladder stone removed. Patient in good health with two lumbar fistulæ, refuses further operation.

Case III.—Female, aged thirty-eight years. Symptoms of stone in right kidney. Operation, stone found impacted in the upper end of gangrenous ureter. Nephrectomy. Six weeks later, anuria and colic on left side. Nephrotomy and removal of conical calculus impacted in mouth of ureter. Recovery.

Case IV.—Male, aged forty years. Stone removed from bladder. Later, symptoms on right side, pyonephrosis and calculus found. Nephrectomy. Later, symptoms on left side. *X*-rays positive, stone removed. Recovery. Later, returned with recurrence on left side. Refused operation, subsequently died of uremia.

Case V.—Male, aged forty-two years. Symptoms of stone on right side. *X*-rays negative. Obesity. Four calculi removed from right kidney. Later, hemorrhage and emergency nephrectomy. Death from suppression of urine. Autopsy revealed multiple stones in pelvis of left kidney with marked pyelonephritis.

Recurrence of stone in a chronically infected kidney was observed in the following case: Male, twenty-five years of age. Traumatic rupture of bladder with fracture of pelvis. Slow convalescence. Ascending pyelonephritis of right kidney, followed by ureteral obstruction and pyonephrosis. Kidney incised. Stone removed, pyonephrosis drained, apparent recovery. Seven months later, symptoms returned. Kidney explored, found to be the seat of large abscess almost completely destroying cortical substance with large secondary calculus. Nephrectomy, followed by recovery.

Intermittent Hydronephrosis. I desire to say a few words in regard to the cases of intermittent hydronephrosis. In 6 of my operative cases the symptoms were such as to justify the belief that we had to do with a frequently repeated temporary blocking of the ureter and distention of the renal pelvis. While these phenomena not infrequently were observed in our calculus cases, the present group comprises only those cases in which the ureteral obstruction was due to factors other than stone. One other case will be added which I saw in consultation and assisted at the operation, making 7 in all. In all there were afebrile attacks of violent renal neuralgia, the pain extending from the kidney along the course of the ureter to the groin. In some instances this pain would become constant if the attack were of long duration, and finally disappear with a copious diuresis.

In all the kidney was at times palpable. In 4 seen during an attack the kidney was distinctly enlarged. In 3 of these the kidney was subsequently found to be normal in size after the subsidence of the attack. In 4 instances at operation the renal pelvis was found to be enlarged and relaxed; in 3 it appeared normal.

This appearance of the renal pelvis is important, and to my mind clinches the diagnosis, for while we may easily be misled by a history of pain, vomiting, tenderness, and renal tumor, all relieved by a copious diuresis, one cannot doubt the conclusion that an enlarged flaccid and wrinkled renal pelvis means a recent distention. It also in my experience indicates a rather obstinate condition, as will be seen by a brief review of several case-histories:

Case I.—A young, unmarried woman, who had repeated attacks of afebrile renal neuralgia, with vomiting and tenderness in the right flank. Seen during one of these attacks, there was present an enlarged and tender kidney. Next day, after diuresis, the tumor had disappeared. On operation a freely movable kidney was found, with enlarged and relaxed pelvis. Normal ureteral implantation; sinus easily palpated; no stone. Kidney replaced and anchored by chromic catgut sutures. During convalescence she experienced another attack more severe than any previous seizure. Would consent to no operation which would not guarantee a cure. The kidney was therefore removed, with prompt healing and permanent cure.

Case II.—History almost identical with the former. Case seen with Dr. A. S. Clark, of New Brunswick. At operation, renal pelvis was found to be relaxed and enlarged; nothing else observed. Kidney drawn upward to straighten ureter and securely anchored in place. Recovery from operation, but recurrence of attacks, which, several months later, became unbearable. Nephrectomy finally performed, with complete relief of pain and great improvement in general health.

Case III.—Female, aged twenty-five years. For two years has experienced attacks of severe right-sided pain, with swelling in the flank, often accompanied by nausea and vomiting. No fever, no hematuria, no frequency in urination. *X*-rays negative. At operation kidney pelvis was found moderately distended with the ureter implanted at its upper extremity and acutely kinked. A large diamond-shaped section of the posterior wall of the pelvis was removed and the wound closed with a fine catgut continuous suture, reinforced by a layer of the fibrous capsule of the kidney, which was stripped from the organ and sutured over the wound in the pelvis. She made a rapid and satisfactory convalescence. No leakage. Primary union of the wound.

Case IV.—An unmarried female, aged twenty-nine years. Suffered for twelve years from recurrent attacks of severe left-sided renal colic, with swelling of the flank. Duration of the attacks from a few hours to four or five days. Patient greatly emaciated by prolonged suffering. Renal tumor distinctly felt, which was as large as an egg-plant and exquisitely tender. No fever, moderate hematuria on one or two occasions. On operation, kidney found displaced downward. Renal pelvis greatly distended. Dense vascular band extending from lower pole of the kidney to aorta (an aberrant renal artery). This band caused a constriction of the dilated pelvis, forming an hour-glass tumor with distortion of the ureteral implantation and obstruction of the tube. The band was divided between two ligatures, and the fluid contents of the pelvis evacuated by moderate compression. The kidney was pushed up into its normal position, which served to straighten the ureter, and the organ firmly anchored in place. The wound healed kindly, but the patient was never free from pain, and several weeks later had a severe attack, with the development of a large renal tumor. Nephrectomy was followed by complete relief. Examination of the specimen showed great thickening of the ureter at the point of previous pressure.

It will thus be seen that in the 4 cases in which an enlarged and relaxed pelvis was found at operation, only 1 was cured by the primary operation, and that was by an extensive plastic procedure which greatly reduced the size of the pelvis. The other 3 required secondary nephrectomy.

Of the 3 cases in which no enlargement of the pelvis was noted all were apparently relieved by anchoring the kidney in place.

GANGRENE. A single case of complete gangrene of the kidney was observed in this series. A married woman, aged forty years, suffered for two months from right-sided renal colic, with vomiting and pyuria. An exploratory operation was done by another surgeon. The kidney was delivered through a lumbar incision and carefully examined for stone or other lesions. As the examination proved negative, the kidney was replaced and anchored by catgut sutures. Considerable pain followed the operation, with fever, vomiting, and great tenderness. These symptoms increased in severity, and the general condition became alarming. The wound was therefore reopened and the kidney found to be completely necrotic, evidently from strangulation of the vessels due to a twisting of the pedicle, the kidney having been replaced at the first operation in an inverted position, with the lower pole uppermost. The necrotic kidney was removed and the patient made a satisfactory recovery.

ACUTE UNILATERAL HEMATOGENOUS INFECTIONS. I now desire to speak of a series of cases, the study of which has proved most interesting to me. I refer to the acute hematogenous infections, in which the lesion is limited to one kidney.

While all surgeons of experience recognize the fact that in many of the suppurative lesions of the kidney the infection reaches the organ by the blood current, and while most observers readily recognize the terminal lesions produced by this pathological process, three important facts regarding the behavior of this form of infection are not generally appreciated by the profession. The first is that these lesions are often unilateral, the second that in the severest type of the affection the toxemia is so overwhelming that death often occurs before any characteristic renal symptoms are developed, and the third is that these cases in their early symptomatology vary greatly, the clinical picture often suggesting an acute grip, lobar pneumonia, appendicitis, or cholecystitis.

In March, 1906, I called attention to this type of infection in a paper read before the Chicago Medical Society, entitled "Some Observations upon Acute Unilateral Septic Infarcts of the Kidney." In it I reported 13 cases, 11 occurring in my own practice, and 2 in the service of my colleague, Dr. Joseph A. Blake. Since the publication of that paper I have observed 8 or 10 additional cases.

Two factors are necessary for the production of this type of renal lesion: (1) A septic focus somewhere in the body capable of furnishing a certain number of pathogenic bacteria to the blood current; and (2) a diminished resistance on the part of one kidney due to trauma, the presence of a calculus, an obstructed ureter, or a previous septic lesion. The disease, therefore, not infrequently follows pneumonia, tonsillitis, any of the exanthemas, typhoid fever, a furuncle, or possibly obstinate constipation, as the colon bacillus is often the offending organism.

In a number of instances I was able to reproduce these lesions in animals by providing the above described conditions. A report of these experiments was included in the paper to which reference has already been made.

With regard to treatment the cases should be divided into three distinct groups: (1) The severest type, in which nephrectomy is necessary to save life; (2) a milder type, in which relief is often afforded by decapsulation and opening and draining the cortical foci; and (3) the mildest type, in which no surgical treatment is necessary.

To illustrate each of these types I shall quote the histories of a few patients previously reported:

Case I.—A woman, aged twenty-two years, experienced a severe pain in the epigastrium and right side of the abdomen, with vomiting and high fever. She was sent to the Roosevelt Hospital with a diagnosis of acute appendicitis. On examination, the appendiceal region was free from evidences of inflammation. There was, however, pain and muscular rigidity in the right hypochondriac region, with tender points over the gall-bladder and in the costovertebral angle. Temperature, 105° F.; pulse, 120; leukocytes, 18,000. Cystoscopic examination was negative; urine from the right kidney scanty and slightly albuminous, a few pus and blood cells; that from the left kidney was abundant and apparently normal. Widal negative; no plasmodia; no tubercle bacilli in the urine. The diagnosis rested between an acute infection of the gall-bladder or the kidney. Small anterior incision, gall-bladder and liver found to be normal, but the right kidney seemed to be enlarged. Anterior incision united and the kidney exposed by lumbar route. The perinephritic fatty tissue was œdematous; the kidney enlarged, highly congested, and the seat of innumerable small infarcts. Nephrectomy was performed. After operation the temperature fell from 105.5° F. to 97° F. within twelve hours, and thereafter remained practically normal. The patient made a satisfactory convalescence. Microscopic examination of the specimen showed it to be filled with minute embolic abscesses. One year later this patient married and became pregnant. I had an opportunity of examining her urine before and after her confinement. It was normal in every respect. Her confinement was normal, and she presented the picture of robust health two months later.

Case II.—A woman, aged thirty-one years, was admitted to the Roosevelt Hospital in a condition of profound septic intoxication. She had had occasional attacks of abdominal pain, of short duration, for the previous six months. Eleven days before admission she experienced severe pain in the right side of the abdomen and flank, extending upward to the chest; this was accompanied by chills, high fever, delirium, and great prostration. At the time of her admission to the hospital, her temperature was 106.5° F; pulse rapid and weak; leukocytes, 35,000. On palpation the only signs that could be elicited were tenderness and muscular rigidity in the right kidney region. The urine contained albumin and a few pus cells. As her condition was extremely critical, she was immediately prepared for operation. On exposing the right kidney there was found a small focus of pus in the fatty capsule near the kidney cortex. The condition of the patient would not admit of further exploration, and she was saved from death on the table only by an intravenous infusion of salt solution. The temperature rapidly rose to 112° F., and she died in a few hours. Autopsy revealed only multiple abscesses and infarcts of the right kidney. Cultures showed Staphylococcus pyogenes aureus.

These 2 cases illustrate the severest type of the disease. The following case presents evidences of a milder type of infection.

Case III.—A woman, aged twenty-six years. Complained of severe right-sided abdominal pain, with nausea, headache, fever, and general prostration. Ten days later she was admitted to the Roosevelt Hospital. Temperature, 102°; pulse, 120; leukocytes, 19,000, of which 81 per cent. were polynuclears. Complained of a bearing-down sensation on urination. The following day the temperature rose to 104°; 82 per cent. polynuclears on differential count. Cystoscoped. Bladder negative; ureters catheterized; from right there was a scanty flow of urine containing albumin, a few pus cells, and blood; from left, more abundant flow, few red cells, practically no pus. Physical examination revealed tenderness in the right costovertebral angle. Kidney not palpated. Left side free from tenderness. Operation on tenth day of illness. Right kidney exposed by lumbar incision; œdema of perirenal fat. Kidney highly congested; presented six distinct cortical areas of induration. Each of these was opened and packed with separate strips of gauze tape, which were allowed to protrude through the partly closed parietal wound. Of the six lesions, only one contained pus, the others necrotic tissue. The renal pelvis was opened; the mucous membrane appeared normal. Cultures made from the pus showed Bacillus coli communis. The patient made a tardy but complete recovery.

Case IV.—A young man, aged twenty-three years, was operated upon by me for an acute streptococcic appendicitis with spreading peritonitis. Although quite septic at the time of operation, he made a satisfactory convalescence. About the sixth day after operation, when the temperature had fallen to the normal, he experienced an acute stabbing pain over the lower ribs on the left side, with a sharp rise of temperature. I regarded the case as one of acute pleurisy, but on physical examination was surprised to find no definite signs in the chest. I called an expert medical consultant, who also was unable to find evidences of plural infection. We were at a loss to account for the pain and fever, which continued for two or three days, when a urinary analysis showed a trace of albumin and a small number of pus and red cells. Subsequent examination revealed the characteristic costovertebral tenderness, and daily examinations of the urine showed the unmistakable evidences of renal infection. The symptoms persisted for ten days or two weeks, but were never severe enough to warrant operative interference.

A few words now regarding diagnosis. The disease may or may not be ushered in by a chill. When present, it generally indicates a severe type of infection. The initial rise of temperature is high, generally 104° F. or 105° F.; the pulse is frequently 120 or above. The toxemia is marked from the first, and with the high fever suggests often an acute grip, lobar pneumonia, or one of the exanthemas. Then follows a more or less vague pain in the abdomen or flank corresponding to the side of the lesion. Tenderness and muscular rigidity over the region of the appendix or gall-bladder leads often to error in believing one of these organs to be the seat of disease. As the urinary secretion from the infected kidney is greatly diminished and is largely diluted by the abundant secretion from the unaffected organ, the mixed urine when passed or drawn from the bladder is often quite normal in appearance, and the slight trace of albumin, blood, and pus is often overlooked unless a more than ordinarily careful examination is made. The one pathognomonic sign present in all cases is a marked unilateral costovertebral tenderness.

To illustrate how frequently this condition resembles an acute intra-abdominal infection, I may state that in no less than six instances during the past three years I have known of a primary incision being made in the abdomen on the belief that the symptoms were due to appendicitis or cholecystitis. In each instance the abdominal cavity was found to be free from infection, the laporatomy wound was closed, and an acutely infected kidney was discovered by a lumbar incision.

Diseases of the Ureters. I desire in conclusion to record briefly my experience in the surgery of the lower ureter. Nine exploratory ureterotomies have been performed for the removal of a suspected stone. In 4 one or more stones were found, while in 5 the result of the examinations were negative.

Case I.—Male, aged thirty-four years. Suffered from right-sided renal colic for twenty-six years. Hematuria and pyuria present. Right kidney explored for stone, with negative result, six months before admission. *X*-ray examination showed dark shadow near spine of ischium. Ureteral orifice everted, catheter arrested in lower ureter. Operation, eight inch incision parallel to Poupart's ligament; external oblique aponeurosis split; internal oblique and transversalis muscles divided transversly. Peritoneum separated from iliac fascia and right side of pelvis. Ureter found and followed to floor of pelvis. Stone felt near ischial spine. Ureter much thickened and dilated above calculus, which was pushed upward to brim of pelvis. Longitudinal incision in ureter, irregular mulberry stone removed. Ureteral wound closed by five chromic catgut sutures, muscles united by plain catgut. Cigarette drain to retroperitoneal space. Skin united with silkworm-gut. Prompt recovery.

Case II.—Male, aged forty-nine years. Suffered from right-sided colic and frequent micturition for two or more years. *X*-rays showed oblong shadow near vesical end of right ureter. Cystoscopic examination showed eversion and œdema of right ureteral orifice. Ureter exposed by same incision as in first case. Calculus felt at junction with bladder. Ureter opened near pelvic brim for exploration with metal bougie. Attempt to push calculus upward to ureteral wound unsuccessful. Second opening over stone, which was easily removed. Both ureteral openings sutured with fine chromic catgut, the lowermost with considerable difficulty. Wound closed. Primary healing.

Case III.—Female, aged forty-three years. Suffered from attacks of left-sided pain for sixteen years. Has had left ovary and tube removed, kidney and ureter explored, and ventral hernia operated upon without relief. Blood and pus in urine. *X*-ray examination showed small distinct shadow at vesical end of ureter. Bladder opened above pubes. Metal bougie introduced into left ureter. Stone felt one-half inch above meatus. Ureteral orifice enlarged and stone removed by forceps. Suprapubic wound closed. Frequent catheterization. Primary union and complete recovery.

Case IV.—Female, aged forty years. Left-sided colic for eighteen years, becoming more frequent and severe for last eighteen months. Slight hematuria and frequency. Cystoscopic examination. Ureteral orifice puffy. Ureteral catheter meets slight obstruction at seven inches, which is, however, easily overcome, and passed to pelvis of kidney. *X*-rays show distinct shadow near pelvic brim. Ureter explored in usual manner. Stone felt just below brim, easily pushed upward to dilated portion of ureter, and removed through longitudinal incision. Wounds closed in usual manner. Complete healing under first dressing.

Case V.—Male, aged thirty-six years. Severe pain in left flank; vomiting, with tenderness over kidney. Hematuria. *X*-ray shadow faint and without well-defined edges near ischial spine. Cystoscope. Ureteral orifice everted, blood emerging; could not be catheterized. Ureter explored by abdominal incision, opened, and found to be patent. Bougie seen in bladder by cystoscope. Wounds closed in usual manner. Prompt healing.

Case VI.—Male, aged forty-eight years. Mild pain over lower left ureter on walking. No urinary symptoms, no vomiting, no pain, no tenderness over kidney. Tenderness in left inguinal region. Distinct shadow on *x*-ray plate in left half of pelvis. Ureter explored by usual incision, hard mass felt in contact with ureter. Ureter opened, probe passed easily to bladder and to pelvis of kidney. Peritoneal cavity opened. Calcified appendix epiploica of sigmoid adherent to parietal peritoneum over ureter. Wounds closed. Primary healing.

Case VII.—Female, aged twenty-six years. Pain in right inguinal region for several months. Appendix removed without relief. Pain paroxysmal, radiating from kidney to groin. Microscopic blood in urine. Cystoscoped. Ureteral orifices normal. Ureteral catheter meets obstruction near kidney pelvis. *X*-rays show faint shadow just above posterior iliac spine. Ureter explored by longitudinal incision in flank. Marked angulation caused by inflammatory band. This was removed, the ureter opened, and bougie passed upward to kidney and downward to bladder. No further obstruction encountered. Wounds closed. Primary healing.

Case VIII.—Male, aged forty-five years. Admitted for operation for chronic appendicitis. *X*-rays showed small round shadow near transverse process of fourth lumbar vertebra on the right side. Abdominal incision over appendix to retroperitoneal space. Ureter explored, opened, and sounded, with negative result. Peritoneal cavity next opened and diseased appendix removed. All wounds closed in usual manner. Primary union.

Case IX.—Male, aged forty years. History of left-sided colic for four years, becoming more frequent during past three months. Pain very severe, radiating to groin. Cystoscoped urine from left kidney blood stained, that from right clear. *X*-rays showed round shadow near transverse process of fourth lumbar vertebra, which corresponded to point of greatest tenderness to pressure. Ureter and kidney explored, no stone found; only an inflammatory thickening around pelvis of kidney. Recovery.

In all of the nine cases healing occurred primarily without infection and without leakage of urine.

All of the patients in whom stone was found suffered severe pain with frequent and painful micturition, and had hematuria. In the three examined with the cystoscope a pouting and œdematous ureteral orifice was seen; in one the ureteral catheter met with moderate resistance, but easily passed the stone to the kidney pelvis. All had shadows with distinctly defined edges. All of the stones were more or less oblong. In one of the negative cases the shadow was distinct and characteristic, and was due to a calcified appendix epiploica. The others were more or less definite; three were round. In the case with a markedly everted ureteral meatus from which blood emerged, but which could not be catheterized, there is reason to believe that a stone may have been present at the time of examination and been passed before or during the operation.

THE EPIDEMIOLOGY OF ACUTE POLIOMYELITIS.

A STUDY OF THIRTY-FIVE EPIDEMICS.

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A new interest in poliomyelitis has been aroused in the last four or five years, by reason of its prevalence in an epidemic form more extensive than had been hitherto observed. Of special importance have been the epidemics in Norway and Sweden, since 1893, and the epidemic in New York City and vicinity, in 1907. Studies made in these epidemics have added much to our knowledge of the pathological anatomy and clinical history of acute poliomyelitis. Nothing, however, that is definite has yet been discovered as to its causation. The occurrence of the disease epidemically has practically established its infectious origin.

Since, at most, accounts of only twelve or fifteen epidemics have been brought together in one paper, it has seemed desirable at the present time to make as complete a collection as possible of the epidemics of this disease which have thus far been reported. An effort has been made to trace these reports to their original sources, on account of the vague and often conflicting references to the epidemics which are scattered through medical literature. The original reports have been consulted in all but a single instance (No. II).

We have collected reports of 35 epidemics of poliomyelitis prior to the year 1907. A careful investigation of this New York epidemic, of 1907, by two of the medical societies is now in progress and will shortly be published. For this reason we have not attempted to include it. The epidemics are widely separated both in time and location, and the records of many of them are very meagre. In fact, few of them have been reported with a degree of care which makes a detailed study of them of great value, although collectively they throw considerable light upon the disease. In the accompanying table, the main facts contained in these reports are summarized.

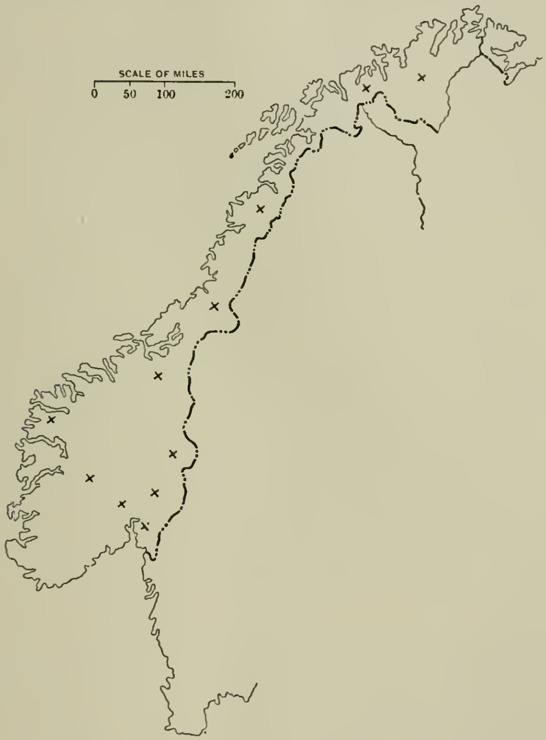
The first recorded epidemic that we have been able to find occurred in West Feliciana, La., in 1841. It is described as follows: "While on a visit to the parish in the fall of 1841, my attention was called to a child, one year of age, slowly recovering from hemiplegia. The parents, who were people of intelligence and unquestioned veracity, stated that 8 or 10 cases of either hemiplegia or paraplegia had occurred during the preceding three or four months within a few miles of their home. Some of these had recovered completely; others were improving." The report concludes with the sentence: "The little sufferers were invariably under two years of age, and the cause seemed to be the same in all, viz., teething." We have no difficulty in recognizing poliomyelitis from the description given.

Location and Extent. The epidemics have been widely scattered over the civilized world. It is rather surprising that no less than 5, and among them the most extensive epidemics recorded, have occurred in Norway during the last ten years. The number of cases reported has varied greatly in the different epidemics; in most of them the number is small. In some the cases were so few as scarcely to deserve the name epidemic. We have included them only because they are frequently referred to in literature. In 23 of the epidemics the number of reported cases is less than 20; in 7 there were from 20 to 50 cases; in only 4 were there over 100. In the epidemic occurring in Australia, in 1904, there were 108 cases; in the one occurring in Vermont, in 1894, 132 cases; in all Norway, in 1905, 719 cases, and in 1906, 334 cases.

On account of their extent, the Norway epidemics deserve more than a mere mention. The cases reported in 1905 and 1906 have been included in the table as single epidemics, but the disease prevailed over a large extent of territory. There were really several distinct epidemic centres of the disease in both years. We have been able to secure details of the cases occurring in 1905; those for 1906 are not at present available. The reports are made by districts. The location of the districts mentioned in 1905 and their relation to one another are shown in the accompanying map, which indicates how widely separated were the epidemic centres throughout the country. The districts are in most instances extensive, covering areas of many hundreds of square miles. The number of recorded cases occurring in northern Norway was much greater than those in the southern half of the country, although the number of centres is smaller. The reports from the northern districts include also the cases occurring in the islands along the coast, where many were observed.

Season. The seasonal occurrence of epidemics is strikingly uniform. In 33 it is definitely stated that the epidemic occurred during the hot season only, or summer and early autumn, the most frequent months being July, August, and September. In almost every instance the epidemic terminated with the month of October. In one Australian epidemic the months of occurrence were March and April, which correspond to October and November in our climate.

Recurrence of the Disease in a Locality After an Epidemic. In studying this subject the question naturally arises whether epidemics have been followed by an increased number of sporadic cases in succeeding seasons, as is seen so often after epidemics of cerebrospinal meningitis. In but one instance have we found it stated that this was the case. In Conegliano, Italy, in 1896, there were 9 cases; the following year in the same village there were 13 cases. After the Stockholm epidemic of 44 cases, in 1887, there were observed during the next seven years but 46 sporadic cases, and these were distributed through all seasons of the year. After several of the epidemics (X, XVI, XXI, XXVI), including some of the larger ones, the statement is made that in succeeding years there was not only no prevalence of acute poliomyelitis, but no cases were observed. From the evidence obtainable it seems altogether improbable that any increase in the number of sporadic cases usually follows an epidemic. In Norway, although successive epidemics were reported in the years 1903, 1904, and 1905, it does not appear, from the reports, that the same communities were attacked. In some it is said that this was not the case. Regarding the epidemic of 1906, published details are wanting and positive statements cannot be made.



Map of Norway, showing epidemic centres of poliomyelitis in 1905.

TOPOGRAPHICAL LOCATION AND HYGIENIC SURROUNDINGS. Location and surroundings seem to have little influence upon the occurrence of epidemics. While in several instances these have been observed in large valleys, it is noted that many of the patients lived upon hillsides, in the best surroundings. The epidemics have been about equally divided between country and city. Most frequently the disease has prevailed in a city or town and the outlying country district, often over quite a large area. Five of the epidemics were in country districts only; and 8 were in small villages.

In the majority of instances it is mentioned that the hygienic surroundings were good. The only example of an epidemic in a crowded community is that in Norway, in 1905, when the disease prevailed with especial severity in the huts of the fishermen living in squalor on the islands along the coast. In a number of instances epidemics have occurred during seasons of little rainfall and low streams. While this is of very doubtful significance, it attracted sufficient notice to be recorded by six or seven observers.

ASSOCIATION WITH OTHER DISEASES. The association of poliomyelitis with diseases other than those of the nervous system is mentioned in only a few of the epidemics, and then evidently with a bias as to its relation. The range has been wide, including measles, whooping-cough, scarlet fever, mumps, and influenza. Especial care has been taken to secure references to diarrhœal diseases. In one Italian epidemic (XXX) it is stated that enteritis preceded in 3 of 26 cases. In the account of the Stockholm epidemic, in 1895, it is said that cholera infantum was especially severe at the time. It is, however, recorded of the Vienna epidemic, of 1898, that while both cerebrospinal meningitis and gastro-enteritis had prevailed the preceding year, they were not common during the epidemic of poliomyelitis.

It is not possible, from the statements made, to draw any deductions as to the association of poliomyelitis with any other disease. In the great majority of the cases the definite statement is made that most of the children were in good health at the time they were taken ill.

The association with certain nervous diseases, especially Landry's paralysis, acute encephalitis, and multiple neuritis, has been mentioned in a few of the epidemics (XV, XXIV, XXV). It is highly probable that in nearly or quite all of these instances these statements are explained by errors of diagnosis. Landry's paralysis has been diagnosticated in a number of instances in which spinal symptoms have been followed by those indicating involvement of the medulla and often proving fatal. These are now believed to represent only a severe form of poliomyelitis with involvement of the upper nerve centres. The same is true of cases of acute encephalitis in which the spinal symptoms are few or wanting altogether. Multiple neuritis has often been diagnosticated because of the severity of the pains in the early stage of the disease, since it was not formerly appreciated that this may be a marked symptom in many cases of poliomyelitis.

MORTALITY. It is difficult to obtain an idea of the percentage mortality when acute poliomyelitis occurs as a sporadic disease. Most of the writers on the subject give the impression that the danger to life is very slight. A study of epidemics, however, leads to a different conclusion. The figures for the separate epidemics are given in the table. Including those in which the mortality is given, there is a total of 1659 cases with 201 deaths, a mortality of 12.1 per cent. The discrepancy between these figures and the opinions drawn from a study of the sporadic form of the disease is, we believe, explained by the fact that cases with bulbar symptoms, which make up the most of the fatal cases in epidemics, have not been recognized as poliomyelitis when they occurred in scattered instances.

AGE. The great majority of the persons attacked with acute poliomyelitis in epidemics are children under four years of age, just as is seen when the disease occurs sporadically. But in epidemics it appears that a somewhat larger proportion of older children and adults are attacked than at other times. Exact figures as to age are seldom given, but in the Vermont epidemic it is stated that a man of seventy years of age was attacked, and in the Dutchess County epidemic, "adults as well as children." In the Australian epidemic of 108 cases, 11 were over ten years of age, the eldest being fifteen years of age.

COMMUNICABILITY. Perhaps the most interesting questions suggested by a study of epidemics of acute poliomyelitis relate to the manner in which this disease is spread. Does any evidence exist that the disease is contagious? Is it possible in an epidemic to trace a connection of any kind between the different cases, either through direct contact or otherwise?

The observations made upon these points fall into certain groups: (1) The general distribution of the cases; (2) the occurrence of more than one case in a family or household, and the interval between the onset in the different cases; (3) the development of poliomyelitis, after contact with a person suffering from the disease in an acute stage, or after moving into a district where the disease is prevailing. It is unfortunate that in the majority of the reports no data whatever are given upon the subject of the distribution of the cases. The following statements contain about all the different writers have to say upon this point:

"The cases were well distributed over the city except for one instance of two in a family" (No. VI).

"No instance of 2 cases occurred in the same street or house" (No. XXI).

"The cases, 64 in number, occurred in groups along the lines of communication. There were very few scattered cases" (No. XXVI).

"The only important group of cases occurred around the periphery of a cemetery" (No. XXVIII).

"The cases occurred in a city and the country roundabout. There was only one instance of 2 cases in the same street" (No. XXXIII*a*).

The comparatively small number and wide distribution of the cases in most of the epidemics is very striking, and seems to indicate that the different cases had no relation to one another or to a common cause. As an offset to these there are, however, records of certain groups which, in the aggregate, are very significant and which point quite definitely to a connection between different cases, indicating either a communication of the disease from one person to another, or the development of several cases near together from a common cause.

We have taken especial care to secure the data regarding the occurrence of more than one case in a family or household. On this subject we have included not only facts derived from a study of the epidemics here collected, but also other single instances which have been scattered through literature.

In all we have collected a total of 40 instances, comprising 96 cases, in which more than 1 case occurred in a family or household.

	Instances.
Two cases in a family	31
Three cases in a family	5
Four cases in a family	3
Seven cases in a family	1

The definite interval between the attacks is stated in 29 instances as follows:

	Instances.
Children taken ill the same day or simultaneously	8
Interval one day	2
Interval two days	1
Interval three days	1
Interval four days	5
Interval five days	2
Interval six days	2
Interval seven days	5
Interval eight days	2
Interval six weeks	1

In 10 additional instances the interval is given in the following words:

	Instances.
Attacked at about the same time	1
Attacked in rapid succession	2
Attacked within a few days	2
Attacked two others shortly after first case	1
Attacked seven children within period of ten days	1
Attacked between five and seven days	1
Attacked between six and thirteen days	1
Attacked between seven and ten days	1

Omitting from the above statements the single case which occurred after an interval of six weeks, which belongs apparently to a different category, and the doubtful case, which occurred after an interval of six to thirteen days, there are 37 instances in which the second case followed the first within ten days, and 33 instances in which the interval was less than one week, while in 13 instances the attacks occurred at about the same time or within twenty-four hours.

The circumstances under which some of these groups of cases occurred are very interesting, and deserve special mention. It is hardly necessary to add that we have included no cases in which the diagnosis of acute poliomyelitis seemed questionable.

Seven Cases in One Family. An English writer, W. Pasteur, records[45] an interesting series of seven children who, he says, "were attacked in the course of ten days, with acute fever; paralytic symptoms followed in three; in two more, temporary disturbance of nervous equilibrium; in the remaining case only the general symptoms present." All these cases were regarded as poliomyelitis. The house in which they lived was situated upon high ground in a healthy neighborhood. The children were previously healthy. Ages ranged from eighteen months to eleven years. No other disease was prevailing at the time.

Four in One Family.[32] Two sisters were taken ill within six days of each other; the father, seven days later; a son, "two days after the father's death."

Four Cases in the Same House.[40] A girl, aged sixteen years, was attacked August 6; a boy, aged one and one-half years, August 14; an infant, aged nine months, August 22; a man, aged twenty-five years, October 4, after a drunken spell. (This is the interval of six weeks referred to above.) There lived in one room, on a small island, a father, mother, and two sons, aged respectively six and sixteen years. Father and one son fell sick simultaneously; one week later the other son was attacked; one week after this, the mother; the surroundings were described as wretched.[42]

Five Groups of Three in One Family. The following are the data furnished regarding these groups: In one family three children, aged respectively nine, two, and six years, were attacked. The child of two years was taken ill two days after the child of nine; the child of six, five days after the child of two years.[42] Three children in the same family were attacked one "shortly after the other."[42] Three children, aged five, four, and two and a half years, were attacked, respectively, on November 10, 13, and 17. The first child died on the seventh day; the second died on the fifth day; the third child recovered. It is stated that two of the children on the day before the attack were "thoroughly soaked."[46] Two children were attacked on the same day, a third child twenty-four hours later.[47] Respecting another group, it is simply stated that three cases occurred in one family.[17]

Two Cases in a Family. Three examples of this have come under the personal observation of one of us (Holt), as follows:

A boy, aged fourteen months, was taken ill on the 23d of the month, and died on the 27th, with bulbar symptoms. A sister, aged five years, was taken ill on the 26th, and recovered with paralysis of both lower extremities. No other cases are known to have occurred in the town at the time (Elizabeth, N. J., 1905).

During the epidemic of 1907, in a family living in a village near New York, a boy, aged eight years, was taken ill on Sunday and died on the following Sunday morning. His brother, aged five years, was attacked the day before the death of the older boy, and recovered with paralysis. No other children in the family. Only one other case in the village, living more than a mile away.

There were admitted to the Babies' Hospital, in October, 1907, two children, aged about two and a half years, from a country home containing about twenty young children. The children attacked with poliomyelitis occupied adjoining beds in the institution. The second child was taken ill seven days after the first one. There were no other cases in the house.

The following examples of two cases in a family or household have been furnished to us by Dr. Charlton Wallace, of the Hospital for Ruptured and Crippled. The cases occurred in the epidemic of 1907:

Two children of the same family, aged respectively ten months and two years, were attacked simultaneously on July 21. Paralysis was noted in both children on the third day, in one affecting both lower extremities, in the other, the left upper. Paralysis was permanent in both.

Living in the same house, but not belonging to the same family, were an infant, aged seven months, and an older boy (age not given). The older boy was attacked with acute poliomyelitis, and the infant was almost constantly with him during the acute stage. One week after this exposure the infant came down with the same disease, the paralysis involving all four extremities.

Living in the same house, but upon different floors and belonging to different families, were two children. On August 7 one child was attacked with acute febrile symptoms, paralysis of the right arm being noted on the third day. The next week the second child fell ill, paralysis developing on the 22d. The two children played together frequently during the week from August 7 to August 14.

Among the other collected examples of two associated cases are several which present features of especial interest.

It is rather striking that there are five instances recorded in which twins were attacked with the disease.

After exposure in bad weather a brother and a sister both fell ill on the same day with fever, and both, three days later, developed paralysis.[60]

Very striking is the grouping of the patients in one epidemic (No. XII) of 17 cases. One group of 10 occurred in the same neighborhood; 2 cases were in the same house; 2 others were sisters; 2 others were brothers; the other 4 children attacked lived near by. In the second group there were 7 cases in the same neighborhood; 3 occurred in the same family; a fourth lived in an adjoining house, and was attacked just ten days after he came there to reside; the other 3 children lived close by.

Two brothers were attacked four days apart. Four days after the second case, a playmate came down with the disease. He was the son of the physician who attended the other patients. In all, 4 cases occurred in a small community of 42 persons (No. XXV).

Besides the instances just referred to, there are a number of others recorded, in which the disease developed shortly after the child moved into the infected district or shortly after leaving it, or under other circumstances which suggest contagion.

A child came to visit in a small village, where poliomyelitis was prevailing (No. XXVI), and was taken ill ten days after arrival.

In one house were three children ill with acute poliomyelitis (No. XII). A healthy child, living at a distance, came to live in an adjoining house, and was attacked with the disease ten days after.

Two children of a physician were attacked ten days after their return to New York, in September, 1907, during the prevalence of the epidemic. The children, a boy, aged eight years, and a girl, aged three years, were taken ill on the same day and at about the same hour. The onset was severe in both cases. The paralysis involved one leg in one child, both legs in the other. The recovery was rapid and practically complete (personal communication).

A brother and sister, aged respectively nine and twenty-seven months, living at a distance, were taken into a town where the disease was prevailing, in the morning, and on the same night, after returning home, both were attacked with fever, which was followed by paralysis (No. V).

A brother and sister, aged respectively five and seven years, were living in a small town outside of London. Two days after the sister was attacked with poliomyelitis the brother was removed to London, where he himself came down with the disease five days later.[48]

On September 1, 1907, a child, aged fourteen months, was taken ill, and paralysis developed on the third day. On one of these three days (we were unable to determine exactly which one) a friend with an infant, aged nine months, paid a visit and put the child in the same crib to sleep with the child suffering from poliomyelitis. On September 8 the second child was taken with fever followed by paralysis. It is a matter of some interest that the first child was said by the mother to have been in contact with a recent case of acute poliomyelitis fourteen days previously; but these facts could not be substantiated (Dr. Charlton Wallace).

Number of epidemic, year, and season.	Place.	Topography and hygienic surroundings.	No. of cases.	Deaths	More than 1 in family.	Relation to other diseases.	Author.	Reference.	Remarks.
I, 1841 Summer months	Parish of West Feliciana, La.	Cases within 3-4 miles of each other	8-10	None	....	....	Colmer, Geo.	1. Amer. Jour. Med. Sci., 1843, vol. v, p. 248	
II, 1881 July	Umea, Sweden	....	13	....	....	....	Bergenholz	....	Original article not found. Referred to by Medin. Hygeia, vol. lii, 1890.
III, 1883 June	Arenzano, Italy	All in a small village	5	2	....	....	Buchelli	2. Il Policlinico, 1897	This epidemic referred to by Buchelli; original account of it not found (no evidence that a full report of epidemic was published).
IV, 1886 July–Sept.	Mandal Cidsvold Ski Laurdal Gjövisk Ruppestadt } Norway	....	9	2	No instance	....	Leegard, C.	3. Om poliomyelit. med. demonstration og mikroskopiske präparter, Neurol. Centralblatt, 1890, vol. ix, p. 760 (Review of above article)	Leegard's original article not found in Surgeon-General's Library, Washington.
							Oxholm, N.	4. Beretning om Sundhedstilstanden og Medicinalforholdene. Norge, 1886, p. 102	In same year epidemics reported in the bracketed districts. The statistics in the table refer to Mandal; no facts have been found regarding the other districts.
								5. Tidsskrift for Praktisk Medicin, 1887, p. 193 vol. 7	
V, June July	Sainte-Foy-l'Argentière, France	Village 1400–1500 inhabitants. Hygiene good	13	4	One instance two children	All in good health	Cordier, M.	6. Lyon Médical, 1888, vol. lvii, p. 5	Reported in detail, mainly clinical.
VI, 1887 May Nov.	Stockholm, Sweden	City	44	3	One instance two children	......	Medin, O.	7. Tenth International Med. Congress, Berlin, 1891, vol. ii 8. Hygeia, 1890, vol. lii	Majority of cases belonged to working class. 30 cases occurred between Aug. 9, and Sept. 30. From 1888 to 1894, 46 sporadic cases evenly distributed through twelve months.

VII, 1889 June–July	Thuringia	....	5	....	......	....	Briegleb	9. Über die Frage der infektiosen Natur der Ac. Polio. 1890	Cases seen in Poliklinik. No cases reported here before. Cases not close together.
VIII, 1893	Two villages near Saint Girons, France.	....	5	....	......	....	....	10. Gaz. des Hôpitaux, 1895, Sept 10, p. 1036	
IX, 1894 Aug.–Sept.	North Adams, Mass.	Lies between two rivers which meet in town; with one exception cases along these rivers. Land between is swampy	10	....	......	....	Brackett, E. G.	11. Trans. of the American Ortho. Ass'n., vol. xi, p. 132	Report very meagre in details.
X, July–Oct.	Rutland, Proctor, and small villages in Vermont	Otter Creek Valley, 30 by 15 miles. Most cases considerable elevation above creek. Hygiene excellent. People prosperous	132	18	One instance	Strong healthy children predominated	Caverley Macphail	12. Main report in Jour. Amer. Med. Asso., 1896, vol. xxvi, p. 1 13. Also in Medical Record, 1894, vol. xlvi, p. 673 14. Yale Med. Jour., 1894 15. Med. News, vol. lxv, p. 619	26,000 population in epidemic district. Climax of epidemic, Aug. 1. Very dry season; surface water low; springs scanty. "13 patients over fourteen years old; 1 patient seventy years old". Animals affected, especially horses, with paralysis; also dogs and fowls; some postmortem examinations made showing cord lesions, so stated.
XI, 1895 (Maximum in Aug. and Sept.)	Stockholm, Sweden	Sanitary conditions excellent	17	None	One instance two children	Infantile cholera especially severe during these months.	Medin, O.	16. Archives des Médecin d'Infants, vol. i, p. 259, and p. 321	
XII, May–Sept.	Ravecca, Italy (section of Genoa)	Crowded quarters, unhealthy	17	None	Three instances; two in two families; three in one family	....	Buchelli	17. Il Policlinico, 1897, vol. iv, p. 249	
XIII, June 23 July 10 One in Aug.	Commune de Montespertoli (near Florence), Italy	Scattered houses in country, in circle 2 km. in diameter. Healthy. All but one farmers	7	None	......	Whooping-cough prevalent, but not so much in this exact section	Pieraccini	18. Lo Sperimentale, vol. xlix, No. 27	

Number of epidemic, year, and season.	Place.	Topography and hygienic surroundings.	No. of cases.	Deaths	More than 1 in family.	Relation to other diseases.	Author.	Reference.	Remarks.
XIV, March and April	Port Lincoln, Australia	Village and country, 1600 sq. miles with population 1500	14	....	Two instances; two in each family	All cases in good health	Altman	19. Australasian Med. Gaz., 1897 April, 24	Phosphorus widely used this year by farmers for fertilizing.
XV, 1896 Summer months	Greene Co., Alabama	Village and country 12 miles in diameter	15	None	......	Much malaria at same time	Bondurant	20. Med. News, Aug. 18, 1900	Included in report are some of "adult cases thought to be endemic or malarial neuritis." No evidence of epidemic in rest of state.
XVI, July (middle) to first week in Aug.	Cherryfield, Me.	Village, healthy; situation "most salubrious"	7	1	One instance two children	All in good health	Taylor, J. M.	21. Phil. Med. Jour., 1898, vol. 1, p. 208	No other cases before or since, *i. e.*, up to 1898 (for two years).
XVII, 1897 Summer	New York City	Six of the cases within radius ½ mile, north of Grand St. and east of Bowery; crowded section	12	....	......	....	Taylor, H. L.	22. N. Y. Med. Jour., 1897, vol. lxvi, p. 192	These cases all came to clinic in June within two or three weeks of onset. All were seen at Hospital for Ruptured and Crippled, out-patient department.
XVIII, July Sept.	Conegliano, Italy	In and near city; elevated land; within 7-8 km.	9	....	......	No other diseases	Fabis, P.	23. La Pediatria, 1901, May	Very meagre report.
XIX, 1898 July Sept.	Conegliano, Italy	Same district	13	....	......	No other diseases	Fabis, P.	24. La Pediatria, May, 1901	Second epidemic, same district, next season.
XX, Summer season	Frankfurt a. Main	City and suburbs	15	....	......	Digestive disturbances, rickets, bronchopneumonia in some of the cases	Auerbach, S.	25. Jahr. f. Kinderheil, 1899, vol. 1, p. 41	These cases (all recent ones) came into Poliklinik in single season. During previous five years only 11 cases were recorded.
XXI, 1898 July Sept.	Vienna and suburbs	City and outlying districts	42	....	No instance	Previous year epidemic of cerebrospinal meningitis and gastroenteritis	Zappert, J.	26. Jahr. f. Kinderheilkunde, 1901, p. 125	This report compiled from records of the different children's hospitals; no other cases included. No instances of cases in same street or house.
XXII, June Sept.	Kiel, Germany	....	4	None	......	....	Von Pleuss, A.	27. Ueber gehäuftes Vorkommen spinaler Kinderlähmung	All these cases seen in Poliklinik.

XXIII, 1899 Sept.–Oct.	Valley of Arno, Italy	Within area 3 km.; country district; climatic condition excellent	5	None	......	Rheumatism present in two families; in third, child had had rheumatism previously	Simonini, R.	28. Gaz. degli osp. e delle clinichi, April 9, 1899	Article written to establish a possible association with rheumatism.
XXIV, July–Oct	Poughkeepsie and Duchess Co., New York	City and country moderate elevation. Hygiene excellent	30	1	One instance two children	....	Mackenzie, D. Chapin, H. D.	29. Med. Record, 1902, vol. lxii, p. 528 30. Arch. f. Pediatrics, 1900, vol. xvi, p. 807	Streams low; although not especially hot summer. Report in 1907 that he had seen no cases in the country district since epidemic.
XXV, June and Aug.	Le Grand, San Joaquin Valley, Cal.	Small village, 42 inhabitants	4	None	One instance two brothers	....	Newmark L.	31. Med. News, 1899, vol. lxxiv, p. 101	Author calls attention to fact that epidemic affected 10 per cent. of the inhabitants.
XXVI, July–Nov.	Bratsburg (county district) Norway	This embraces territory comparable to county in U. S.; most of cases along lines of communication. Very hilly country	64	2	Two instances (1) four in family, two daughters, son, and father; (2) two in family, sisters	Son in (1) had cholera nostros. In Laardal there was an epidemic of diarrhœa and vomiting, but only one child with poliomyelitis was suffering from gastroenteritis	Leegard	32. Norsk Magazin for Laegevidenskaben, 1901	The subdivisions indicate definite districts of several square miles in area which are under the supervision of a physician especially appointed by the government. There are two families reported, each of eight children, in each of which only one child was afflicted. In 45 of the cases the diagnosis was positive, some doubt of diagnosis in the remainder. 1903–1905 no cases recorded in Bratsburg. Most of children perfectly well when attacked.
	Skien		9						
	Bamble	....	1						
	Dirangedal	....	10						
	Hollen	....	6						
	Ulefoss	....	9						
	Bö	....	4						
	Koiteseid	....	8						
	Laardal	....	17						
			64						
XXVII, June–July	Thuringia	Small district	5	....	......	....	Briegleb	33. Uber die Frage der infektiosen Natur der Ac. Polio., 1890	Cases seen in Poliklinik. No cases reported here before.
XXVIII, 1900 June–Sept.	Gloucester, Mass.	Village; radius 4 miles; almost surrounded by water; parts are high; solid rock underlies whole of it. Hygiene good	32	1	......	....	Painter, C.	34. Boston Med. and Surg. Jour., vol. cxlvii, p. 633	Special interest in a group of 12 cases "occurring around periphery of a cemetery."

Number of epidemic, year, and season.	Place.	Topography and hygienic surroundings.	No. of cases.	Deaths	More than 1 in family.	Relation to other diseases.	Author.	Reference.	Remarks.
XXIX, 1901 May and June	San Francisco and vicinity, Cal.	City and country. Humidity greater and less sunshine than for fifteen years previous. Locality played no part	55	....	No instance. One instance of second youngest in family of 9 children only one afflicted	....	Woods, A.	35. Occidental Med. Times, vol xvii, p. 77	Largest number were in San Francisco and vicinity, also a few cases reported entire length of state, seaboard, mountains, valleys. Thirty of these cases seen in San Francisco clinics. Unauthentic report of 25 more cases in the state.
XXX, 1903 March–Sept.	Parma, Italy	City and country, all classes	26	....	......	Three cases had gastroenteritis	Lorenzelli, A.	36. La Pediatria, 1904, p. 428	Very brief report.
XXXI, 1904 March–April	Brisbane, Australia	Hygiene: large number of cases outpatients at hospitals notoriously "ill-nourished and ill-fed"	108	4	Not common to find more than one	Epidemic preceded by severe epidemic of influenza and extraordinary outbreak of mumps	Ham, B.	37. Australasian Med. Gaz., 1905 vol. xxiv, p. 193	Author calls attention to the fact that formalin was common in milk supply of Brisbane, and records an instance of an adult who was suddenly attacked with paralysis in several limbs after swallowing a small amount of formalin.
1903–1906	Norway	Includes practically all of Norway	....	....	......	......	Harbitz, F. Scheel, O.	38. Jour. Amer. Med. Assoc., 1907, vol. xlix, No. 17, Oct. 26	For special articles see description under each year.
1903		......	18	6					
1904	...	......	61	12					
1905	..	......	719	111					
1906	..	......	334	34					
XXXII, 1903 Oct.–Dec.	Hadeland and Land	......	19	4	......	....	Giersvold, M.	39. Norsk Mag. for Laegevidenskaben, 1905, vol. lxvi	No description of epidemic given.
XXXIIIa, 1904 June–Oct.	Hvaler	Includes several scattered towns. Majority of cases in Fredrikshald (city), others in country about	41	6	No instances, but four cases in one house. Onset Aug. 6, 14, 22, and Oct. 4	No other diseases recorded	Naunestadt	40. Norsk Mag. for Laege., 1906 vol. lxvii, p. 409	July–Aug. 30 cases. Epidemic seemed to spread from place to place. Cases scattered over entire city of Fredrickshald; only one street in which there were two cases.

XXXIII*b*, 1904 Sept.–Nov.	Aafjorden	District of a number of sq. miles	20	6	......	....	Platou, E.	41. Tidsskrift for Norske Laegeforenning, 1905, No. 17, vol. xxv, p. 601	
XXXIV, 1905	Norway. Widely scattered over country (See map)	Hygienic surroundings very poor in many epidemic districts. Many cases occurred on islands along the west coast. Here houses are overcrowded. Most severe cases occurred where there was most squalor	436	69	......	....	Geirsvold, M.	42. Norsk Magazin for Laegevidenskaben, 1905, vol. lxvi, p. 1280	
June–Sept. (July–Aug., 53)	S. Drontheim	....	139	20	Four instances: in two families three in each; in the third, four; in the fourth, two				
	N. Drontheim	....	81	21					
	Nordlands	....	84	8					
	Tromsö	....	14	None					
	Finmarkens	....	2	"					
	Romsdal	....	12	"					
	Hedemarkens	....	17	4					
	Kristiano	....	6	1					
	Buskerud	....	26	3					
	Smaalenes	....	18	7					
	Akershus	....	11	1					
	Kristiana	....	26	4					
			436	69					
	Norway Districts not specified	....	283	42	.	....	Harbitz and Scheel	43. Jour. Amer. Med. Assoc., Oct. 26, 1907, p. 1420	These cases mentioned by Harbitz and Scheel as reported to State Board of Health. Locality not mentioned. These with districts specified make a total for Norway 1905 of 719 cases; 111 deaths.
		Total	719	111					
XXXV, 1906	Norway	.....	334	34	......	.....	Harbitz and Scheel	44. Jour. Amer. Med. Assoc., Oct. 26, 1907, p. 420	Cases reported to State Board of Health with no details.

Three servant girls living in different houses returned together to their home. While there, and shortly after their arrival, all three came down with acute poliomyelitis (No. XXXIV).

A nursemaid who had taken care of a case of acute poliomyelitis went to another child in a different town. Fourteen days later the second child was attacked with the disease (No. XXXIII *b*).

A grandmother visited a child suffering from acute poliomyelitis. Thirty-six hours after her return to her own grandchild it was attacked (No. V).

Conclusions. The occurrence of epidemics and the relation of certain groups of cases to one another in these epidemics place beyond question the statement that acute poliomyelitis is an infectious disease. Whether we can go farther and state that the disease is communicable is an open question. After carefully considering all the evidence brought together in this paper, we cannot resist the conclusion that the disease is communicable, although only to a very slight degree, one of the most striking facts being the development of the second cases within ten days after possible exposure. Positive statements, however, must be deferred until the discovery of the infectious agent.

The preceding table gives the principal facts regarding the epidemics collected, together with the references to the literature.

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SUPPURATIVE PHLEGMONOUS GASTRITIS.

WITH THE REPORT OF A SUCCESSFUL LAPAROTOMY (PROBABLY THE FIRST) IN THE TREATMENT OF A CASE.

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Suppurative phlegmonous inflammation of the stomach wall is a condition rarely encountered by clinicians of even great experience. Probably the whole of medical literature does not contain reports of cases exceeding seventy-five in number. Several writers mention the first description of phlegmonous gastritis as having been made by Borel (Opera) in 1656. It is claimed, this description was of the circumscribed variety, while mention of the diffuse form of the disease was not made until Cruveilhier described it so graphically in 1861. Leith, who wrote the classical production that appears in Allbutt's System of Medicine (1907), states that the first mention of the circumscribed variety was made in 1620, by Varandaeus (Tractatus de Morbis Ventriculi). Mayo Robson and Moynihan have published nearly all the cases that could be found in literature, and I have enough more scattering reports of cases, made before and since their reports were published, to bring the number of suppurative cases close to 75. But those authors have written upon the general subject of phlegmonous gastritis without regard to the presence or absence of pus. In their table of 85 cases but 63 have been proved to be of the suppurative variety of the disease. Other authors have treated the subject in this broad manner, which, after all, is probably best, except from the standpoint of treatment. Even in this, should surgical means be instituted, necessity for careful distinction would not exist, particularly as pre-operative diagnosis heretofore has practically been impossible.

Synonyms. Various titles, each supported by reasons sufficiently logical for its existence, have been employed in descriptions of this pathological condition or reports of cases observed. Among these may be mentioned acute suppurative gastritis, gastritis submucosa, employed by Dittrich, Klebs, and others; phlegmon ventriculi, or gastritis phlegmonosa, by Lebert and Bamberger; linitis plastica et suppurativa, by Brinton; gastrité interstitielle suppurative, by Auvray; and submucous suppurative phlegmon, by Krause and others. A considerable number of French observers speak of it as linite phlegmoneuse. Robson and Moynihan regard phlegmonous gastritis as the most apt term.

Varieties. Of phlegmonous gastritis two distinct anatomical varieties are observed, the circumscribed and the diffuse. Pathologically and symptomatically they might be contrasted, although operation before or after death has probably been required for diagnosis in every case reported. In no instance has a diagnosis before operation or death been authenticated, although it is claimed it was made in one of Chvostek's cases and by Dörbeck and McCaskey. In one case (Callow's) the patient vomited a pint of pus in the presence of the surgeon and pus was found in the stools before death. In some cases, however (Deininger, Glax, Beckler, Kirchmann, and Rubner), pus is said to have poured into the stomach or neighboring organ from a circumscribed abscess in the wall, and recovery to have followed. Cicatrices found in the stomach wall have been attributed by Leube, Oser, and others to the rupture of such abscesses, but this conclusion in the light of our knowledge of the disease must be regarded as purely conjectural. The diffuse form is the most common. Robson and Moynihan found in 85 cases they studied that the diffuse form was present in 63 and the circumscribed in but 11 cases.

Complications. The complications of this disease are carcinoma of the stomach and peritonitis. It is not necessary to add that either of them would somewhat lessen the probability of recovery were such result probable.

Pathological Anatomy. The stomach wall is invariably thickened, in some cases to three-fourths of an inch. This thickening is most marked near the pylorus. In my case this fact was emphatic. The mucosa is usually smooth, having petechial and necrotic areas. In some instances small sieve-like apertures, through which pus exudes, are found. The submucosa becomes infiltrated with pus to a greater extent in the diffuse than in the circumscribed form and from the cut section of the stomach wall pus exudes under pressure. In the circumscribed form the pus may be localized in one large abscess or in several small ones. The muscular coats sooner or later become involved by the process and become infiltrated with pus. The serous coat may not escape, and perforative peritonitis results. This process is so rapid that it is practically never limited by adhesions, but becomes rapidly general. Thrombosis of the veins of the liver, lungs, and stomach may be present and acute pleurisy has been observed.

Etiology. The disease is purely one of acute virulent infection. The most frequently met microörganism is the one always present in phlegmonous inflammation—the streptococcus. The colon bacillus, the staphylococcus, and other organisms are not uncommon invaders. The gas bacillus was probably present in a few cases. Mixed infection appears to be quite the rule rather than the exception. The disease may arise suddenly and primarily in perfect health, with no preceding malady, constituting the so-called idiopathic variety, which is by far the most frequent, or it may be a sequel of some chronic or slow form of infection by metastasis or result from recent or remote trauma. Cancer of the stomach and of the œsophagus are not uncommon precursors. Osler mentions having seen the disease in two cases of gastric carcinoma. It is found as a complication of puerperal sepsis and typhus fever. Leith conveniently classifies the etiology of the disease under the following six heads: (1) Sex; (2) age; (3) alcoholic excesses; (4) dietetic errors; (5) injury; and (6) blood poisoning. In the cases, numbering about 70, in which the sex is given, the male sex has been attacked in about 80 per cent. Leube found that, of 26 cases, but 5 of them occurred in women.

No age seems exempt from this disease. Hun's case, which occurred in a girl, aged ten years, is the youngest I found recorded. Leith found, in 65 cases, that 5 occurred between the ages of ten and twenty years, 18 between twenty and thirty years, 10 between thirty and forty years, 13 between forty and fifty years, 7 between fifty and sixty years, 7 between sixty and seventy years, and 4 between seventy and eighty years.

The oldest was eighty-five and the youngest ten years. This is somewhat at variance with the table of Glax, who classified 34 cases as follows: 4 occurred between the ages of ten and twenty years, 8 between twenty and thirty years, 4 between thirty and forty years, 7 between forty and fifty years, 4 between fifty and sixty years, none between sixty and seventy years, and 7 between seventy and seventy-six years.

Leith's statement that it is most frequent in early adult and middle life seems practically supported by the recorded cases, although, in half as many cases studied, Glax found those of extreme old age —seventy to seventy-six years—frequently attacked. Alcoholic excess appears to have had a causal relation in about one-fourth of the cases, although many writers believe it causes the disease in about half the cases. Certain it is that but a very small fractional part of 1 per cent. of people addicted to alcoholic excess have had this disease. Dietetic error just preceding the sudden onset of an attack is recorded in many instances. My case had such a history. Many histories show that great indulgence in eating as well as in drinking was followed by what was considered as acute indigestion, accompanied by vomiting of undigested food and perhaps bile, that soon proved, usually by necropsy, to be this disease. A few cases have been thought to have resulted from traumatism to the epigastrium. This relation in some cases seems quite remote. Hopkins reports one case in which, four years before an attack of this disease, the victim, a man, was jammed between the bumpers of cars. As a sequel of gastrostomy for gastric troubles it has been noted in a few instances. Silcock reports a case operated on by Mr. Howard Page for œsophageal stricture that had been produced by an epithelioma. The attack came on twenty-one days after the operation, and in six days proved fatal. Some writers have illogically concluded that ulcer must be the usual cause inasmuch as the inflammation is most noticeable near the pylorus, as is the ulcer. Various poisons and drugs, such as iodide of potassium and oxalic acid, have been blamed as etiological factors.

It is by no means clear whether in the idiopathic cases the infection comes from the gastric mucosa or through the blood channels. One would reasonably infer that if through the blood, other localities would be likely to exhibit similar manifestations. Whether excessive amounts of hydrochloric acid or trypsin may become deleterious to the gastric mucosa is not proved. To consider this disease as a severe type of gastric erysipelas would seem to be the most rational conclusion and to offer the best idea of the mode of invasion. This is a grave form of inflammation, and we know in severe types of erysipelas pus is formed. Whether minute abrasions are present in the mucosa, affording ingress of microörganisms, we do not know.

In the careful examinations made of the stomachs removed at necropsies the mucosa has been found, as a rule, practically normal, although petechial and necrotic areas are mentioned. Robson and Moynihan state there is probably always some abrasion. In my case a hurried examination revealed merely a much reddened mucosa, attributed to three days of almost constant vomiting.

Symptomatology. *The Diffuse Form.* This disease has no special characteristic symptoms, and from its extremely violent and abrupt beginning it is nearly always diagnosticated and treated as acute indigestion or acute gastritis for the first two or three days. A quite common history is that of perfect health, a very hearty meal of some specially liked food, followed in a few hours by intense pain in the upper half of the abdomen and vomiting of undigested food, stained with bile. Diarrhœa or constipation may be noted, the latter ofttimes following the former. Chills, fever, meteorism, great thirst and hunger, delirium, and coma commonly supervene, and death is almost inevitable. Leith found in his analysis of 85 cases that pain was present in 75 per cent. of the cases, sometimes preceded by a chill or rigor. It generally appeared with more or less suddenness on the first day and varied from a mere sense of discomfort or weight in the epigastrium to violent pains of a cutting or burning kind. Sometimes it did not appear until the second, third, or fourth day, and usually increased in severity. It was mostly continuous, being rarely paroxysmal and rarely subsiding for any length of time. It was nearly always localized at first to the epigastric region, spreading either slowly or suddenly to the rest of the abdomen with the onset of general peritonitis. As a rule, pressure increases the pain.

Vomiting is nearly always present. In Leube's collection there was but one case free from it, and in that one nausea was present. Vomiting is usually frequently repeated and continues to the end. The vomited matter, after undigested food, is at first watery and contains alimentary matter and mucus, soon becoming tinged with bile. In two cases pus was vomited. Jaundice was present in 16 per cent. of the cases collected by Leith. In most cases fever, varying from 99° to 104° F., is present.

The pulse, full at first, becomes very small, weak, and thready, later irregular. Hiccough is a common symptom. Restlessness and and anxiety, beginning early, are soon followed by wandering speech and delirium. Usually coma and collapse precede death.

The Circumscribed Form. The symptoms are nearly the same as in the diffuse form of the disease, although the localized pain increased by pressure and the increased epigastric resistance are more marked. The duration of the disease is more prolonged and great emaciation occurs. In some cases a distinct tumor in the epigastrium has been discovered. The vomited matter may contain pus either in large quantity, as in Callow's case, or in such small amounts as to escape notice.

DIAGNOSIS. The sudden onset, the localized pain increased by pressure, and the sense of increased pressure in the epigastrium, together with the distressing vomiting of materials as mentioned, the chills, fever, pulse changes, and general aspect of the patient, the increasing severity of the condition, particularly if peritonitis ensue, suggest suppurative phlegmonous gastritis. If in addition a tumor appears in the vicinity of the stomach the presumption is stronger, and yet stronger if pus be vomited. With all these the diagnosis cannot be positive. It has to be differentiated from perigastritis, from ulcer of the stomach, suppurative cholecystitis with gallstones, hepatic abscess, acute pancreatitis, and poisoning from caustics. It is quite evident this will, in most cases, be impossible. Examination of the blood has not been sufficiently practised to afford assistance; in but two cases, according to Boas, has the blood been examined. In Mintz's case he found poikilocytosis and in Lengemann's the leukocyte count was 30,400. If pus be present the proportion of leukocytes would probably be increased.

PROGNOSIS. This is exceedingly unfavorable in the diffuse variety. But two cases have been known to recover. In the circumscribed form a few have been reported in which rupture of the abscess into the stomach has occurred and recovery followed. These must be considered as possible errors in diagnosis. In the diffuse form the duration is from one to seven days. In the circumscribed it is probably longer.

TREATMENT. With the exception of four instances, none other than symptomatic has been employed for the diffuse variety. The great progress made in surgery of the epigastric region, however, encourages the more frequent employment of exploration by laparotomy. Perhaps by this measure incision and drainage will prove beneficial. Certainly, in a positively fatal condition the employment of new forms of treatment are to be encouraged. Whether serum treatment would be of avail has not been answered owing to failure in the diagnosis and employment of the serum. In the circumscribed form little better has been accomplished.

In the case reported by Leith exploratory laparotomy was done and the peritoneal cavity washed out, as considerable peritonitis was present. The stomach wall was not invaded, and the patient died in collapse seven hours later. The necropsy failed to reveal pus in the stomach wall.

In another reported by Robson and Moynihan a gastric ulcer had reoded the pancreas and an abscess of that organ had burst into the stomach, causing acute gastritis and severe vomiting with impending death. Posterior gastro-enterostomy was followed by recovery. In another case of non-suppurative phlegmonous gastritis the same operation was followed by death. No. 80 of Robson and Moynihan's table is von Miculicz's case of non-suppurative circumscribed inflammation of the stomach wall; no pus was present. The patient was a male, aged eighteen years, with a clinical picture of perforative gartric ulcer. Localized peritonitis was present. The anterior wall of the stomach was much thickened, rigid, and covered with fibrinous layers. The inflammatory focus in the stomach wall was uniformly light red and œdematous and not enclosed by adhesions. It was about the size of the palm of the hand, and within were two yellowish-gray maculæ of irregular border, but about the size of a "mark piece" (coin). No perforation was found. Repeated saline irrigation was followed by an iodoform gauze plugging over the involved area, which had not been opened, and three sterile gauze tampons were introduced into the peritoneal cavity. Recovery followed.

It is thus evident that down to the report of my case (herewith), no case of suppurative phlegmonous gastritis has been operated upon. The four cases cited, however, have a very strong relation to the surgical treatment of the suppurative form of the disease. It would seem, and more particularly from these cases, that opportunity for drainage by abdominal section and external drainage with or without gastric incision is necessary. Gastrostomy or gastro-enterostomy seems to be strongly indicated, particularly as the pyloric end of the stomach is usually most involved. In my case the pylorus was completely obstructed. Gastro-enterostomy would afford drainage of the stomach into the intestine, and incision into the submucous coat with adequate technique would afford exit for pus and relieve tension. Robson and Moynihan recommend in mild terms gastrostomy or gastro-enterostomy in acute diffuse phlegmonous gastritis, and in the circumscribed form they state "opening and drainage of the abscess would be advisable."

The history of my case is as follows:

Circumscribed suppurative phlegmonous gastritis; gastrostomy; complicated by pregnancy at six months and abortion; recovery.

Mrs. T., white, aged thirty-six years, who had had seven children, followed in 1895 by a miscarriage, was brought in an ambulance to the Columbia Hospital for Women, late on the night of October 6, 1907, by her physician Dr. John S. Dorsey. She had suffered from pain in the epigastric region for several years, which was usually relieved by taking food. Her last menstrual period occurred April 13, 1907, and she considered herself pregnant. The history of this illness as given by Dr. Dorsey is about as follows: October 3 she ate heartily of boiled cabbage for dinner and crabs late at night. In the night she was attacked by severe pain in the region of the stomach. Dr. Dorsey was called and gave morphine for pain. The following day the pain continued and vomiting set in. An attempt to move the bowels by enemas and cathartics was unavailing. The temperature was elevated, ranging from 99.5° to 101.5° F., the pulse rapid and weak. The next day croton oil was employed by the mouth, but the bowels failed to respond. The various remedies at the command of Dr. Dorsey were not effective in relieving the pain, constipation, and vomiting. The vomited material was first solid and partially digested food. Later it was watery and frothy, changing to dark green. She was so enfeebled and appeared to be so very ill that he secured an ambulance and took her to the hospital Sunday night, as already mentioned. No chill or sweat was experienced. I saw her about eleven o'clock that night, she having reached the hospital a few minutes earlier. At that time her pulse was thready and her countenance anxious in appearance. On examination on the anesthesia carriage I discovered the uterus extended to an inch above the umbilicus, and the epigastrium was distended, exquisitely tender, and tympanitic. She was promptly anesthetized, and in the presence of Dr. Wallace Neff and Dr. Dorsey, an incision in the median line above the uterus was made. The intestinal loops were found congested, but non-adherent. The stomach was palpated. It was found to be fully three-fourths of an inch thick at the middle of the greater curvature, gradually thinning toward the cardiac end. In the pyloric end and in front was a mass nearly the size of a man's fist that was soft although not doughy to touch. This gradually thinned out toward the middle of the stomach. The stomach was opened at about its middle by a longitudinal incision about three inches long and the mucosa inspected. The lumen of the pylorus would not permit the entrance or engagement of the tip of my little finger. More definitely to determine the nature of the enlargement, a separate short incision was made over it when the nature of its contents was manifest. Gauze was packed around it and it was opened, and two or three ounces of grayish pus escaped. The long incision was closed and the pus cavity wiped out. A rubber tube was tightly sutured into it and brought out of the abdomen. A light gauze drain was packed about it. The patient was fed by the rectum for twenty-one days. Five days after operation liquids were given by the mouth, as salt solution by hypodermoclysis and liquids by the rectum did not quench her ravenous thirst. The following day contents of the stomach came through the wound. A few days later solid food was given and the tube removed. Stomach contents ceased escaping in a few days. On the eighth day with little effort she aborted, the fœtus living three hours. With the exception of infection of the abdominal incision, which required re-suturing, she has made an uninterrupted recovery.

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GALLOP RHYTHM OF THE HEART.

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Gallop rhythm of the heart is not a rare clinical phenomenon, but it has been variously interpreted, and unanimity of opinion has not been reached in regard to its cause and significance. In fact, the mechanism of the production of all heart tones, both normal and abnormal, is difficult to determine, as several possible tone-producing factors are always present. Muscular contraction, the passive vibration of heart walls and valves, and the movements of columns of blood must all be considered as possibly sound-producing.

The studies which will be described in this paper were made from only those forms of gallop rhythm which are best heard at the apex of the heart or over the central portion of the precordium, the true gallop rhythm, and nothing will be said in regard to the minor interpolation or splitting of heart sounds, such as are frequently heard at the base of the heart, and which form the systolic type of Cuffer. Potain[1] considers this latter form, however, and defines gallop rhythm as a triple sound of the heart formed by the addition to the two normal sounds of an abnormal third sound. This abnormal third sound, which is neither a puff nor an accentuated part of a normal sound, is a sound of a beat interposed between the normal sounds in one or other of the silences. Reference will be made only to those forms of gallop rhythm in which the extra sound occurs during one part or another of diastole.

Two well-recognized forms of diastolic gallop rhythm occur. In one the extra sound closely precedes the first normal cardiac tone. In the other the extra tone occurs in the first part of diastole following the second normal cardiac tone. These forms have been designated by Potain and subsequent writers as the presystolic and the protodiastolic forms of gallop rhythm. Potain recognizes a third, a mesodiastolic form, in which the extra tone occurs in the middle of diastole. To the auscultating ear gallop rhythm occurs as a group of three sounds, usually of unequal intensity followed by a pause. Any one of the sounds may be accentuated, but usually it is either the first or the last sound of the group. The pause, as will be referred to later, may be either diastolic or systolic.

Gallop rhythm occurs in such a variety of conditions that it is difficult to draw any conclusions from a consideration of clinical data alone. The graphic method of studying the heart's beat is of distinct aid in the solution of this phenomenon of gallop rhythm. The extra sound producing gallop rhythm is usually accompanied by a shock which can be felt by palpation at the point of maximal impulse of the heart beat. This extra shock produces an effect in tracings taken from the apex beat of the heart, and gives the cardiograms a characteristic appearance. Potain,[2] the Chauveaus,[3] Brauer,[4] Kreige and Schmoll,[5] Friedrick Müller,[6] and others have used the graphic method for the study of gallop rhythm, and all are agreed as to the forms of cardiograms produced by hearts showing this phenomenon. The significance of the tracings, however, have been variously interpreted.

The accompanying tracings were taken with an apparatus similar to the polygraph described by Mackenzie[7] in his book on the pulse. Simultaneous tracings were made from the apex beat, the venous pulse in the neck, and the carotid artery. Synchronous points in the tracings from the various parts were marked out by measuring equal distances from the points where the marking needles were at rest.

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[1] La Semaine médicale, 1900, xx, 175. Les bruits de galop.

[2] A. Chauveau. Jour. de Phys. et de Path. gén., 1900, ii, 125. L'intersystole du coeur.

[3] H. Chauveau. Thèse de Paris, 1902, No. 315. Etude cardiographique sur la mécanisme du bruit galop. (Not read.)

[4] Verhand. des Kongresses für innere Med., 1904, xxi, 189.

[5] Zeit. f. klin. Med., 1891, xviii, 267. Ueber den Galloprhythmus des Herzens.

[6] Münch. med. Woch., 1906, liii 786. Ueber Galloprhythmus des Herzens.

The cardiograms obtained by this method agree very closely with those of others, and may be divided, except in one instance, into the presystolic and the protodiastolic groups. In the former a distinct wave is seen occurring just before the large wave of ventricular systole, while in the latter a wave is seen in the first part of diastole. These extra waves occur apparently synchronously with the extra sounds, and so it is fair to suppose that the two phenomena are manifestations of the same cardiac peculiarity. As has been pointed out by H. Chauveau, however, these two waves which accompany the extra sounds of both types of gallop rhythm are present in cardiograms from hearts producing normal sounds, and it is only when there is some accentuation or displacement of these normal waves that the cardiogram can be considered characteristic of gallop rhythm.

Satisfactory tracings could not be made from all the cases of gallop rhythm encountered, but in 9 cases tracings sufficiently good for study and analysis have been obtained. Of these cases, 3 showed the presystolic type, 5 showed the protodiastolic type, while 1 was of Potain's mesodiastolic type.

In the tracings obtained from the cases of presystolic gallop rhythm the most striking feature of the cardiogram is a well defined wave occurring just before the large wave caused by ventricular systole. Synchronous with it there occurs a large positive wave in the tracing taken from the venous pulse in the neck, and there can be little doubt that both these waves are dependent upon the contraction of the auricle for their formation. The arterial pulse tracing shows no corresponding wave. As the impulses forming these waves in the cardiogram and in the venous tracing occur at the same time as the extra tone of presystolic gallop rhythm, it is fair to believe that the extra tone is produced by the auricular contraction, either as a muscle tone or as a more remote effect. This belief has been disputed, however, and a number of other ideas have been advanced in explanation of gallop rhythm which exclude the auricular contraction as an essential element in the production of the extra sound.

Several of the older conceptions of the mechanism of gallop rhythm, however, do not stand in accord with recent advances in knowledge of the anatomy and physiology of the heart. For instance, asynchronous contraction of the two ventricles was formerly held as the cause of gallop rhythm, but after such careful studies of the musculature of the heart as that of J. B. MacCallum,[8] who showed that the same bands of muscle encircled both ventricles, it is difficult to conceive that such asynchronous contraction is possible.

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[7] The Pulse and the Movements of the Heart, 1902. London: Churchill & Co.

Bard[9] has recently reviewed various theories of gallop rhythm, especially those held by French investigators. His own idea of the cause of presystolic gallop rhythm is that there is a separation of two elements usually fused to form the first normal cardiac tone. He believes that the first of these elements is caused by the tension of the septum of the ventricles at the beginning of ventricular systole, and that the second element is due to the vibration of the mitral and tricuspid valves in their closure. His arguments do not seem to be very well sustained, although he mentions several reasons why other theories are unsatisfactory. Doll[10] has recently advanced the idea that the two sounds that occur instead of one at the beginning of systole in presystolic gallop rhythm are due to a double contraction of the ventricle.

Müller, on the other hand, in his excellent paper on gallop rhythm, advances the belief that presystolic gallop rhythm is due to a strengthened blood stream from the auricle to the ventricle, and he considers that the auricular contraction plays an important role in the production of this phenomenon. Johnson[11] considers that "the contraction of a dilated and especially of an hypertrophied auricle becomes sonorous, and that the first division of the double first sound in the cases under consideration is the result of auricular contraction." He thinks that this sound may be produced by (1) muscular tension; (2) impulse against the chest wall; (3) forcible impact of the blood driven forward by the auricle against the stationary blood in the ventricles. Both the right and the left auricle may be the cause of the extra sound. Exchaquet, working under Potain, came to similar conclusions, independently and at the same time as Johnson.

According to Müller, Marey believes that the extra sound is produced by the auricle sending blood into a defectively emptied ventricle. Müller considers that the extra tone may be dependent upon a delay in the time between the auricular and the ventricular contractions possibly due to lowered conductivity of the auriculoventricular bundle of His, and that when the two contractions are abnormally separated, two sounds instead of one are produced. He believes that the distinctly shortened diastole as compared to the systolic time, may be responsible for the delay, the recovery time being insufficient for the heart to regain its normal power of conducting the heart beat from one part of the heart to another. Gallop rhythm was produced by Schiff by causing an increase in the heart rate by vagus stimulation.

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[8] Johns Hopkins Hospital Reports, 1902.

[9] La Semaine Médicale, 1906, xxvi, 229. Du bruit de galop de l'hypertrophie du cœur gouche; son mécanisme et sa signification clinique.

[10] Berl. klin. Woch., 1905, xlii, 1440. Weiteres zur Lehre vom echten doppeltan Herzstoss.

[11] Lancet, 1876, i, 697. Triple Pericardial Friction Sounds, and on Reduplication of the First Sound of the Heart.

The views of Potain are especially interesting. He thinks that the auricular contraction plays but a secondary part. Potain believes that the extra sound is produced at the moment when the ventricles become distended in their dilatation. The myocardium, as other muscles, is endowed with tonicity, and this tonicity is in antagonism to the influences which tend to force the blood into the ventricle during diastole. If the cardiac muscle looses its tonicity, the ventricle in dilating, arrives rapidly at a point where the fibrous resistance of the septum limits dilatation. Thus, a quick check is produced, a sudden tension, a shock, and the extra sound of gallop rhythm results. Potain believes that the combination of a strongly acting heart and fibrous changes in the heart walls, which increase the fibrous resistance of the septum, are the most favorable conditions for the production of gallop rhythm. Such a combination is not infrequent in chronic nephritis. Hypertrophy of the auricle contributes to the production of the extra tone, but Potain does not believe that the simple exaggeration of the auricular systole is sufficient for the production of a tone, as this systole has not been shown to be sound producing.

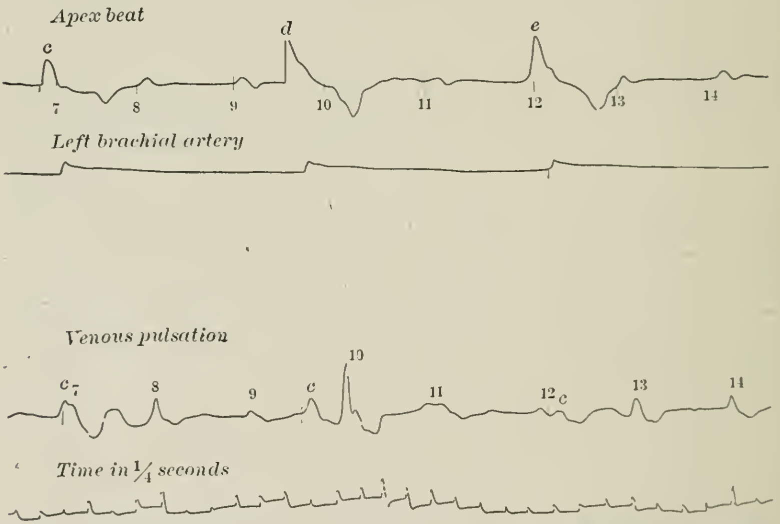


FIG. 1.—From a case of complete heart block. The waves due to the auricular contractions are marked by numbers. The letter *c* in the venous pulse tracing marks the waves that come synchronously with the carotid pulse. Ventricular systoles are marked by letters.

This last statement of Potain is readily disproved, however, by a study of a case of Stokes-Adams syndrome, or heart block. Here the auricles and the ventricles when the block is complete, contract independently and at very different rates. In the case from which the accompanying tracing (Fig. 1) was taken, loud booming sounds were produced by the forcible ventricular contractions, while short, rather faint but distinct tapping sounds were heard agreeing in time with the auricular contractions, as seen in the cardiogram and the venous pulse tracing. This phenomenon has been noted by a number of recent students of heart block, and all agree that the more frequent sounds are the result of the auricular contractions. These sounds are usually considered of muscular origin.

A study of the cases of gallop rhythm that I have observed seems to show that the extra tone in presystolic gallop rhythm is not always

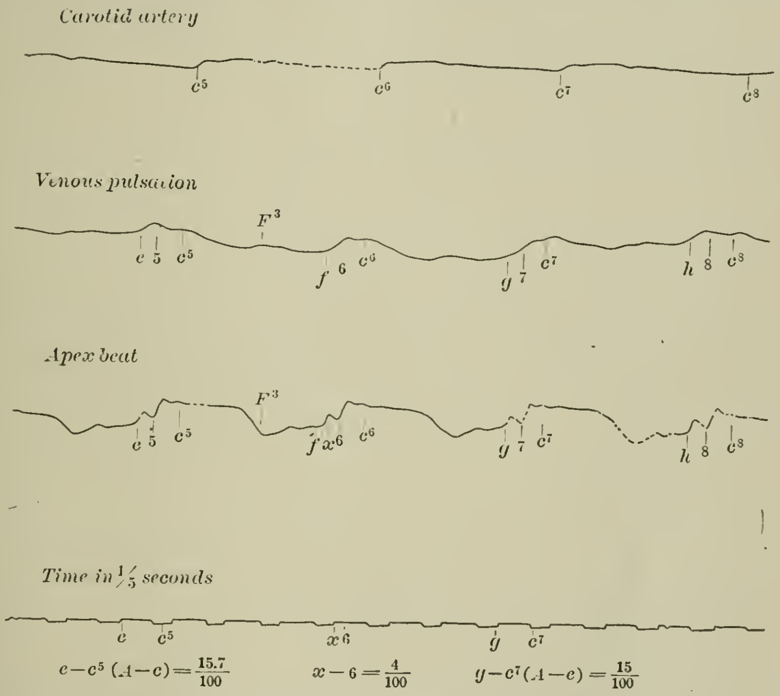
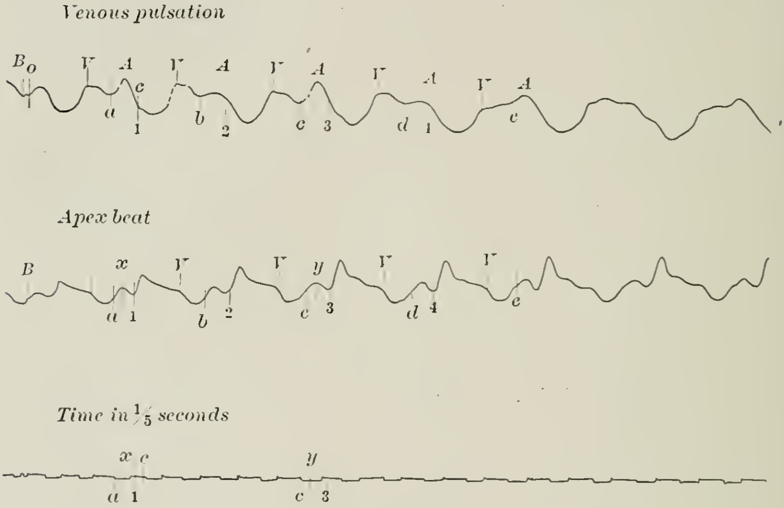


FIG. 2.—From a case of subacute or chronic nephritis. Presystolic gallop rhythm. Small letters mark the waves of auricular systoles; numbers mark the waves of ventricular systoles; the letter *c* marks the beginning of the carotid wave; *f* marks the opening of the tricuspid valve and the end of ventricular systole, as indicated by the venous pulse; and *x* marks the auricular wave crest.

produced in the same way. The cases have been divided into two groups: One group includes patients suffering from chronic nephritis, aneurysm of the descending aorta, exophthalmic goitre, and mitral stenosis; cases in which the heart was hypertrophied. The other group consists of cases of typhoid fever, usually in the height of the disease with weakly acting hearts. In both classes cardiac rapidity was seen, but the force of the heart was distinctly different. In the first group cardiograms were readily obtained, while in the cases of typhoid fever showing gallop rhythm, six or eight of which were studied, tracings were never sufficiently good for satisfactory analysis. In the cases belonging to the first group it seems probable that the extra, presystolic sound was produced by a strongly acting auricle. In but one of the 3 cases did the relation to one another of the waves in the venous pulse tracing indicate that there was a delay in the transmission of the heart beat from the auricle to the ventricle.

The first of the tracings belonging to Group I (Fig. 2) was taken from a case of chronic or subacute nephritis. On the day the tracing was taken the pulse was about 90 per minute, the heart was enlarged to percussion, the apex beat was forcibly felt in the fifth space 10.5 cm. from the mid-line, and a very distinct presystolic gallop rhythm could be heard at the apex, but more distinctly and loudly over the central portion of the heart. The systolic blood pressure was 165 mm. Hg (Stanton instrument). The time from the beginning of the auricular wave in the venous pulse to the wave synchronous with the carotid wave, is found to vary from $13\frac{3}{100}$ seconds to $15\frac{1}{100}$ seconds in different cardiac cycles. (See Table I.)



$a-1=\frac{15}{100}$ sec.

$x-1=\frac{7}{100}$ sec.

$a-c=\frac{18}{100}$ sec.

$c-3=\frac{16}{100}$ sec.

$y-3=\frac{9}{100}$ sec.

FIG. 3.—From a case of aneurysm of descending aorta. Presystolic gallop rhythm. Markings as in Fig. 2, except V, which marks the end of ventricular systole, as indicated by the venous pulse tracing. x and y mark the auricular wave crests.

The second tracing (Fig. 3) is from a case of aneurysm of the descending aorta. The gallop rhythm, presystolic in type, was very distinct and constant for months. On the day the tracing was taken, the pulse was 112 per minute, the cardiac dulness was distinctly enlarged, and the point of maximal impulse was in the sixth space 4 cm. outside the left mammillary line. The gallop rhythm was extremely well heard over the precordium and at the apex, but it was loudest and most distinct in the third space at the left of the sternum. The tracing shows a very well marked wave in the cardiogram preceding the large ventricular wave, and accompanied by a marked venous wave. The time between the beginning of the auricular wave in the vein and the wave synchronous with the carotid wave, which is poorly seen, is never more than $\frac{18}{100}$ second.

The third tracing, which is not reproduced, was taken from a case of mitral stenosis complicated by typhoid fever. On the day the tracing was made the pulse was 110 to 112 per minute. The blood pressure three days later was, systolic 118 mm. Hg and diastolic 95 mm. Hg. Here the A-C time was lengthened, and was in most cardiac cycles $\frac{23}{100}$ second.

Müller measures the time between the auricular and the ventricular contractions by noting the time between the crest of the presystolic, or auricular wave, and the beginning of the ventricular systolic wave in the cardiogram. In all of his tracings from cases of presystolic gallop rhythm he finds this time lengthened beyond the normal, which is, according to Egren and himself, from $\frac{2 \cdot 5}{100}$ to $\frac{5}{100}$ of a second. This time was from $\frac{6}{100}$ to $\frac{10}{100}$ of a second in his cases. The time from the crest of the presystolic or auricular wave to the beginning of the ventricular systolic wave in my first case was but $\frac{4}{100}$ of a second, as a rule, and was never prolonged beyond the normal limits, while in the second and third cases this time was $\frac{7}{100}$ and $\frac{6}{100}$ respectively. It is seen then that presystolic gallop rhythm may occur without a delay in transmission of the heart beat from the auricle to the ventricle. In the third case the tracing from the venous pulse indicates that a delay was present; Müller's method of measuring also showed this. But this was a case of typhoid fever complicating mitral stenosis, so that it seems to be a combination of the two classes of cases—those with the strongly acting hearts, and those cases of gallop rhythm seen during a severe febrile disease.

In the cases of presystolic gallop rhythm which have strongly acting hearts, according to Müller, hypertrophy and dilatation of the auricles are usually found postmortem. This is to be expected from the class of cases in which the phenomenon occurs. I have had the opportunity to study the heart postmortem in but one case, that from which Fig. 2 was taken. This patient died suddenly with rupture of his aneurysm. The heart was enlarged and very firm in consistency. It weighed 520 grams. The walls of all of the heart chambers were hypertrophied, but especially the right auricle which measured 3 mm. in thickness. The muscle had a solid, compact appearance, and microscopic sections from the walls of the various parts of the heart showed rather coarse, large, well preserved muscle cells. No gross lesion was seen in the region of the auriculoventricular bundle. This portion of the heart was removed and hardened, but no microscopic study of it has been made as yet.

From a consideration of the foregoing cases it seems very probable that the extra tone of gallop rhythm may in some cases depend entirely upon increased, forcible action of hypertrophied auricles, although a delay in the transmission of the heart beat would certainly tend to accentuate the distinctness of the tone.

In regard to causes of delay in the transmission of the heart beat from the auricle to the ventricle through the auriculoventricular bundle, Aschoff[12] believes that when the heart is hypertrophied the auriculoventricular bundle may be so small relatively that it is unable to convey the impulse as quickly as it does normally. This may be a factor in the causation of gallop rhythm, especially in cases or chronic nephritis with hypertrophied hearts.

In all probability the mechanism of the extra tone of presystolic gallop rhythm heard in strongly acting hearts is similar to that of the sounds arising from the auricular contractions in heart block or Adams-Stokes syndrome, in which the sounds are best heard or often only heard in the upper part of the precordium. I believe this sound is of muscular origin, due, in gallop rhythm, to the strongly contracting auricles. For the production of the extra sound a delay in the transmission of the heart beat is not necessary. The statement of Howell,[13] that the contraction of a bloodless heart can produce a sound, has some bearing on this point.

The other class of cases of presystolic gallop rhythm, those occurring especially during the height of typhoid fever, with a weakly acting heart and with a low blood pressure, are obviously due to some cause other than increased auricular action. In these cases also the extra tone seems to arise in the auricle, but the condition of the heart muscle must be quite different from that of the first group. We know from clinical experience with this class of cases that the gallop rhythm is transitory, and usually occurs with a rapid, poorly acting, sometimes irregular heart at the height or toward the end of severe cases of febrile diseases, especially typhoid fever. There is probably present a loss of muscular tone, and perhaps conditions are such that a delay in the transmission of the heart beat is present.

No satisfactory tracings could be obtained from this class of cases, and without these it is impossible to measure the time of conduction from the auricles to the ventricles. It is possible that in the case of mitral stenosis complicated by typhoid fever, in which tracings showed a delay of transmission of the heart beat from the auricle to the ventricle, it was the febrile disease that caused the faulty conduction.

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[12] British Medical Journal, 1906, ii, 1103. Discussion of heart block.

[13] Text-book of Physiology, 1905: Philadelphia: Saunders & Co.

In the protodiastolic type of gallop rhythm the extra tone and the shock which produces a wave in the cardiogram are synchronous with the first rush of blood from the auricle into the ventricle, at the beginning of diastole when reëxpansion of the ventricle occurs. Müller believes that this form of gallop rhythm, as well as the presystolic form, is associated with an increased flow of blood from the auricle to the ventricle. He has observed patients, as has Potain, in which the presystolic type of gallop rhythm went over into the protodiastolic type. Potain considers the mechanism of the protodiastolic type to be the same as that of the presystolic type. In the former, the sudden increase of tension of the ventricular walls, which he believes is the cause of the extra shock and sound, occurs earlier in diastole and accompanies the first rush of blood from the auricle, instead of late in diastole, when the auricular contraction suddenly completes the filling of the ventricle.

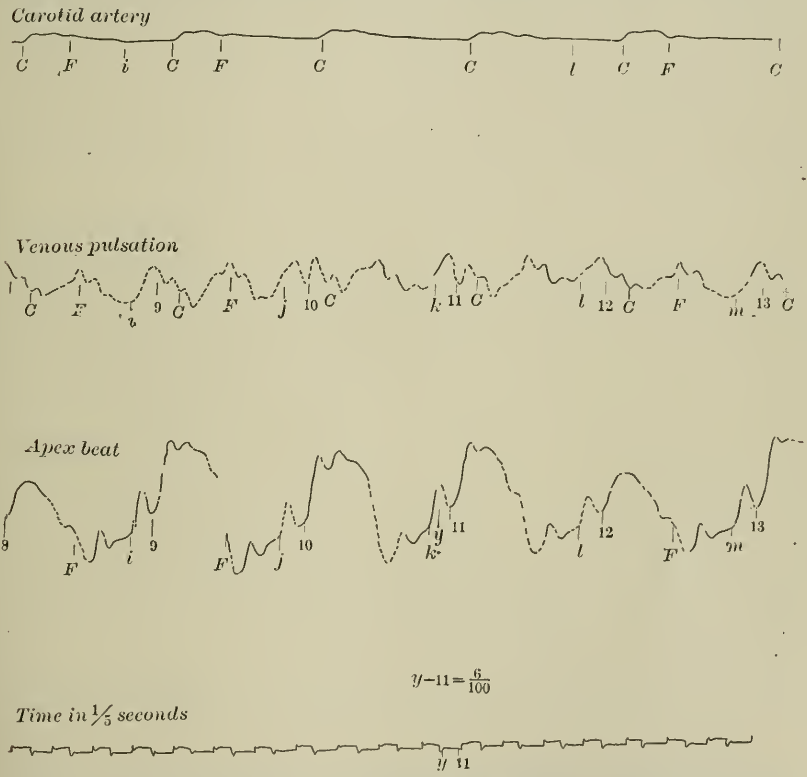

FIG. 4.—From a case of myocarditis. Protodiastolic gallop rhythm. Both the prodiastolic and the presystolic waves are well shown. Markings as in Fig. 2.

I have obtained satisfactory tracings from 5 cases, showing protodiastolic gallop rhythm. The first case, from which Fig. 4 was obtained, was a man of fifty, who on admission had an enlarged irregular heart, but no cardiac murmurs. Fairly well marked arterial sclerosis was present. Frequent extra systoles were observed, and the patient was considered to have chronic myocarditis. This patient had no cardiac symptoms. He had been doing heavy work, and was admitted on account of hernia. At times, but not constantly, there was heard at the apex a fairly definite protodiastolic gallop rhythm. At the time the tracing (Fig. 4) was made the heart was acting regularly. The two diastolic waves are very well seen, and from the tracing it cannot be told which form of gallop rhythm was present. However, the only extra tone that could be heard followed the second normal heart sound, in spite of the fact that a delay in transmission of the heart beat is indicated by both the method of measuring of Mackenzie[14] and of Müller. The heart was enlarged and beating forcibly. In another tracing, which showed extra systoles followed by diastolic pauses (Fig. 5), the protodiastolic wave was always associated with the beginning of diastole. The protodiastolic wave was followed by a gentle rise in the cardiogram, which ended

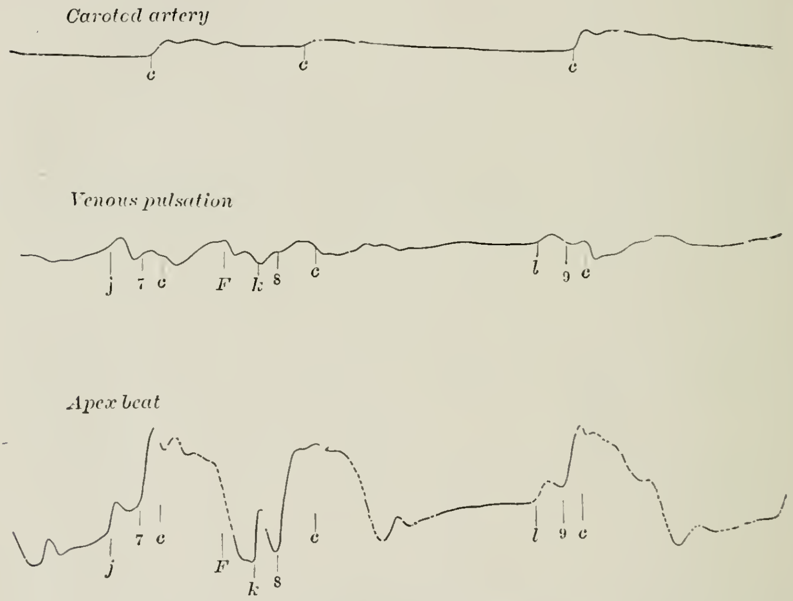

Fig. 5.—Same case as Fig. 4. An extra systole followed by a pause is shown. Protodiastolic wave is in the first part of diastole.

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[14] British Medical Journal, 1906, ii, 1103. Discussion of heart block.

in a distinct wave preceding the next ventricular systole. This is a further indication that the protodiastolic wave is associated with the first rush of the blood from the auricle into the empty ventricle. It confirms an observation made by Dietrich Gerhardt and recorded by Müller.

The second case of protodiastolic gallop rhythm from which a tracing (Fig. 6) was obtained, was that of a young man, twenty-three

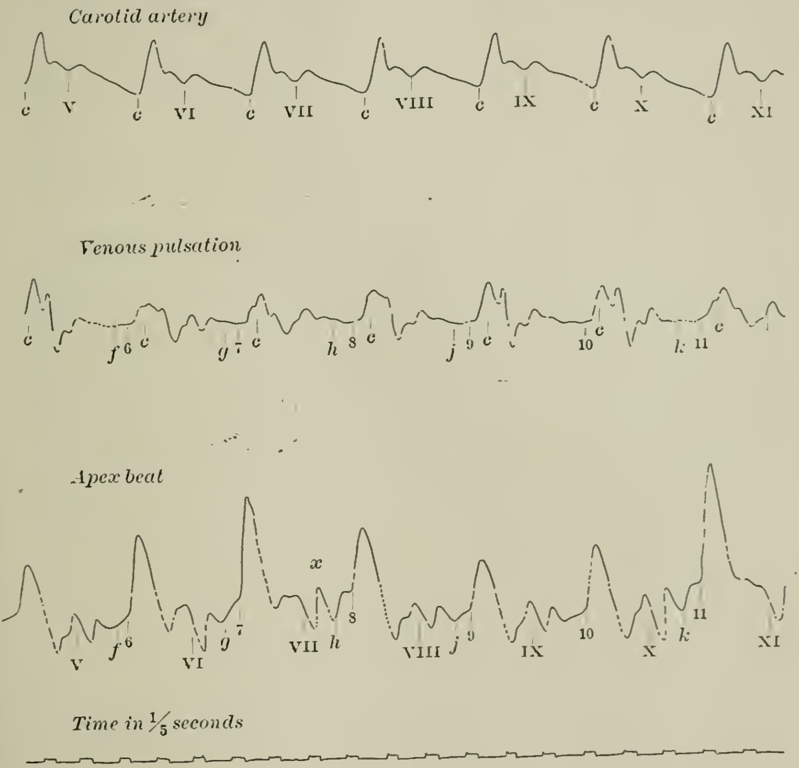

Fig. 6.—From a case of chronic endocarditis. Protodiastolic gallop rhythm. Roman numbers mark the end of systole, as indicated by the dicrotic notch of the carotid artery. Wave marked *X* is the protodiastolic wave. Other markings as in Fig. 2.

years of age, suffering from chronic endocarditis with broken compensation. There was aortic regurgitation as well as mitral regurgitation and stenosis. The blood pressure, taken several days before the tracing, showed, systolic 125 mm. Hg, and diastolic 85 mm. Hg. The heart was distinctly enlarged, and at the time the tracing was made the apex beat was in the fifth interspace 14.5 cm. from the midline. Cardiac dulness extended 4.5 cm. to the right, and 16.5 cm. to the left, of the midline. A sharp tapping impulse could be felt at the apex which occurred soon after the completion of the apex beat. This second impulse was accompanied by a sound which somewhat confused the second normal heart tone. At this time, about one month after admission, at the apex only a systolic murmur could be heard, and this did not obscure the protodiastolic gallop rhythm that was present. In the tracing a large, sharp wave is seen in the first part of a very short diastole, and precedes a somewhat indefinite presystolic wave. The protodiastolic wave follows quite closely the closure of the aortic valves, as indicated by the well marked dicrotic notch in the carotid artery, which, according to Otto Frank and others, occurs synchronously with the closure of the aortic valves. According to Müller, the reëxpansion of the ventricle comes on measurably later than the closure of the aortic valves, and so would correspond to the position of the marked protodiastolic wave. The venous pulse was quite poor, and the tracing of it at this time was not satisfactory.

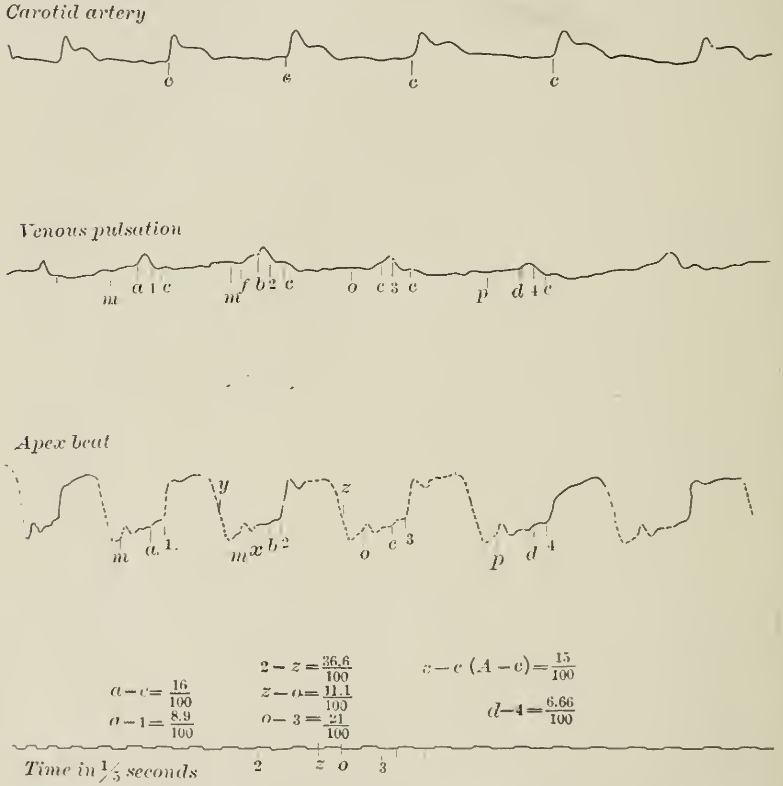

FIG. 7.—From a case of secondary anemia. Protodiastolic gallop rhythm. Markings as in Fig. 2. *m*, *m*, *o*, *p*, mark the beginning of protodiastolic waves. *Y* and *Z* mark the end of the ventricular systoles.

The three other cases of protodiastolic gallop rhythm were all of severe anemia. They did not show as well marked protodiastolic waves as the other tracings, but in the cardiograms from all of them this wave could be made out more distinctly than in any tracings I have taken from normal hearts. The first case (Fig. 7) had severe secondary anemia. The hemoglobin was 20 per cent., and the red cells were 1,544,000 on the day the tracing was taken. The pulse was 80 per minute. The other 2 cases, the tracings from which are not reproduced, were splenic anemia and progressive pernicious anemia respectively. In the case of splenic anemia the gallop rhythm was marked and present over a period of some weeks. It diminished as the patient recovered. In the case of pernicious anemia the gallop rhythm was transient and heard only at times. In these 3 cases, the hearts were slightly enlarged and the radial pulse was of low tension.

In protodiastolic gallop rhythm, there is an extra tone closely following the normal second cardiac sound, falling in the first part of diastole, associated with a definite extra or modified wave in the cardiogram, and occurring at the time when the blood first rushes from the auricles into the empty, flaccid ventricles. The crest of this protodiastolic wave is synchronous in all of the tracings with a negative wave or dip in the venous pulse, which indicates that the blood is leaving the auricles and the adjacent veins while it is suddenly distending the ventricles, producing the characteristic wave at the apex. This point was noted by Brauer, and was confirmed by Müller's tracings.

The two forms of gallop rhythm which have been described in this paper are best heard in distinctly different parts of the precordium. While the presystolic form is best heard in the middle portion of the precordium, the protodiastolic type is best heard, and is often only heard, at the apex of the heart. This indicates that the latter form of gallop rhythm is due to an extra tone which has its origin in the ventricles rather than in the auricles.

There are two factors to be considered in attempting to determine why the blood in first entering the ventricles should produce a sound and should modify the protodiastolic wave in the cardiogram. The first factor is change in the walls of the ventricles, and the second factor is an increase in the amount or in the velocity of the flow of blood from the auricles into the ventricles. Potain lays stress upon the first and Müller upon the second factor.

In the cases I have studied, there was evidence of lack of tone of the heart muscle in all, and in the first case, at least, there was probably an increase in fibrous tissue in the heart walls. In all of the cases of protodiastolic gallop rhythm except the first there is reason to believe that there was an increase in the amount and velocity of the blood stream into the ventricles.

The regulation of the flow of the blood from the auricles into the ventricles depends upon several factors. Goltz and Gaule and others have shown that a negative pressure may exist in the ventricles just after they go into diastole. Any abnormal increase in this negative pressure would cause the blood to rush into the ventricles more forcibly than usual. The pressure produced in the auricles by the accumulation of blood from the veins during ventricular systole, when the mitral and tricuspid valves are closed, is also a factor which controls this flow of blood. Any increase in this pressure, as is seen with the congestion that is so often present in cardiac insufficiency, would increase the amount and velocity of the blood stream from the auricles to the ventricles.

Another factor is suggested by Müller. Tracings from cases of gallop rhythm often show a distinct decrease in the diastolic time of the cardiac cycle. This decrease of the diastolic time is associated with rapid heart action, which always reduces the diastolic time relatively much more than it does the systolic time. When the diastolic time is shortened, the blood has less time to flow from the auricle to the ventricle than it has under normal conditions, and, therefore, must go more quickly. Consequently, the diastolic collapse of the heart is more sudden, and the first rush of blood from the auricle to the ventricle is more likely to cause an impression in the cardiogram and to produce an extra tone.

It seems probable, however, that the phenomenon of protodiastolic gallop rhythm is caused by a combination of circumstances which allows an increased flow of blood from the auricles into the ventricles in hearts in which there is a loss of muscular tone. As the extra sound is best heard at the apex of the heart, it is probably produced in the ventricles, and is, as Potain believes, the effect of the first part of the rush of blood from the auricles into the ventricles upon the walls of the ventricles.

The case of gallop rhythm, the type of which does not agree with either of the foregoing types (Fig. 8), was one of marked cardiac insufficiency, both valvular and muscular. The physical signs and symptoms of badly broken cardiac compensation were present, and when the tracing was taken the heart rate was 150 per minute. The first normal heart sound was loud, and was the last of a group of three which seemed equidistant from one another. The tracing shows a large extra wave in the cardiogram, even higher than that caused by the ventricular systole, and occurring in the central portion of diastole. This case would then fall in Potain's group of mesodiastolic gallop rhythm. The venous pulse was unsatisfactory and the carotid pulse produced no record, but this tracing has been interpreted, with the help of several others from the same patient, in which the venous and the arterial records were better.

It is difficult to say what factors were concerned in the production of the gallop rhythm in this case. The gallop rhythm was heard equally well at the apex of the heart and over the central portion of the precordium. Although measurements in this case are difficult and uncertain, there was apparently a slight delay in the transmission of the heart beat, but from clinical considerations it would seem probable that the paralysis of the auricles, such as Mackenzie has observed, was present, and that the auricular contraction had but little to do with the production of the extra sounds. This case apparently resembles more closely the protodiastolic than it does the presystolic type.

If the points in the cardiograms at which the various sounds occur are determined, the cardiogram serves as an easy means for indicating in what part of the cardiac cycle the long pause comes.

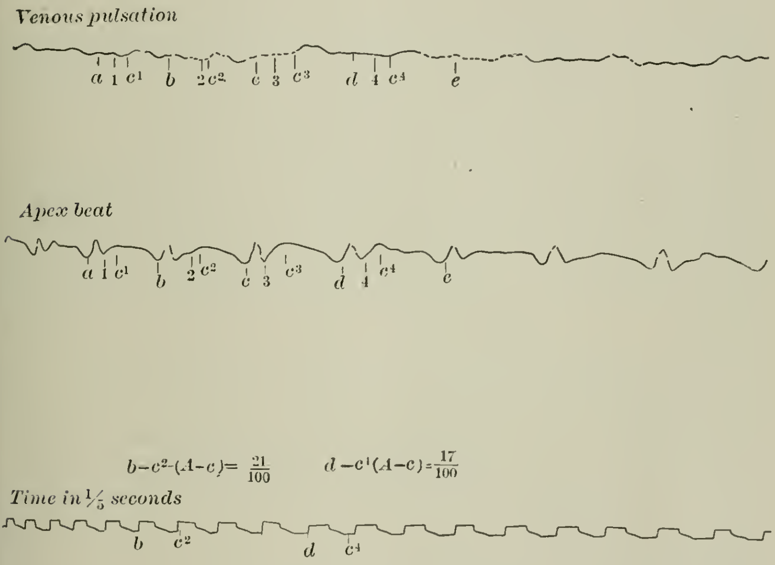

Fig. 8.—From a case of chronic endocarditis and myocarditis. Mesodiastolic gallop rhythm. Markings as in Fig. 2.

According to Howell, Marey has shown that the first sound occurs immediately after the beginning of systole, and the second immediately after the beginning of diastole of the ventricles. The second normal cardiac sound is usually considered as caused by vibrations set up by the closure of the aortic and pulmonary valves. Points in the cardiogram synchronous with the dicrotic notch in the carotid artery may, therefore, be taken as marking the time when the second normal heart sound occurs. The beginning of the wave of venrticular systole marks approximately the point at which the first heart sound occurs. The extra sounds of gallop rhythm begin in all probability with the beginning of the extra or modified wave, and continue during the upstroke of the wave.

In all of the tracings from cases of gallop rhythm in which I have measured the time between the various sounds, the longest silent period is during systole. This is shown in Table I. The first 2 cases (Figs. 2 and 3) are presystolic gallop rhythm, so that the diastolic silence lies between the second heart sound and the extra sound, while the next 3 cases (Figs. 4, 6, and 7) are protodiastolic, in which the diastolic silence lies between the extra sound and the first heart sound. In the last case (Fig. 8) the beginning of the extra sound lies almost midway between the second and the first heart sounds. It must be borne in mind, then, when listening to gallop rhythm, that the extra sound is usually the middle one of the group of three, and that the last sound of the group, which is often accentuated, is very likely the first normal cardiac sound.

Summary. Gallop rhythm of the heart is a fairly frequent clinical phenomenon, which consists in the presence of a group of three cardiac tones, none of which are murmurs. It occurs under variable clinical conditions. That form of gallop rhythm which is best heard at the apex, or over the central part of the precordium, may be divided into the presystolic, protodiastolic, and mesodiastolic types, depending on whether the extra tone falls at the end, at the beginning, or in the middle of diastole. Each form is associated with a characteristic cardiogram. There are a number of factors which probably combine in various ways to produce the various forms of gallop rhythm.

Presystolic gallop rhythm is heard in two classes of cases. It is heard in strongly acting hearts in which a muscle sound produced by a strongly acting, hypertrophied auricle is probably the cause of the extra tone; and it is also heard in weak, rapidly acting hearts at the height of acute febrile diseases, at which time there is possibly a delay in the conduction of the heart beat from the auricles to the ventricles. Under these circumstances the sound produced during the contraction of the auricles becomes distinguishable from that produced during the contraction of the ventricles. In both classes of cases, the extra tone seems to be produced in the auricle rather than in the ventricle. Protodiastolic and mesodiastolic gallop rhythm are caused by the production of an extra tone in the ventricles. The factors that probably combine to produce this extra tone are an increase in the amount and velocity of the flow of blood from the auricles into the empty ventricles and a loss of tone of the heart muscle of the ventricles. The longer silent period in cases of gallop rhythm does not usually occur during diastole, but is usually a systolic silence.

Table I shows the time relations in the cardiograms between the points where the two normal heart sounds and the extra sound of the gallop rhythm occur. It shows that the longest distance between any two sounds always falls at the time of ventricular systole.

TABLE I.—TIME IN HUNDREDTHS OF SECONDS.

No. of Fig.	Time from first to second cadiac sounds.	Time from second sound to extra sound.	Time from extra sound to first sound.	Variety of gallop rhythm.
II	34	28	6.6	Presystolic.
III	28.5	15	10	Presystolic.
IV	60	10	28	Protodiastolic.
VI	33	6.6	20	Protodiastolic.
VII	36.6	11	21	Protodiastolic.
VIII	26.4	6.6	10	Mesodiastolic.

Table II shows the results of the two methods of measuring the time of conduction of the heart beat from the auricles to the ventricles.

TABLE II.—TIME IN HUNDREDTHS OF SECONDS.

Name or Number.	I.	II.	Remarks.
Egren		2.5–4	Normal.
Müller . . .		3–5	Normal.
Author . . .	12–20	2.5–6	Normal.
Erlanger . . .	14	4.5	Exposed heart.
1.	15	4.4	Nephritis. Presystolic.
2.	18	7	Aneurysm. Presystolic.
3.	23	6	Mitral stenosis and typhoid fever. Presystolic.
4.	24	7.3	Myocarditis. Protodiastolic. Both waves marked.
5.	20	5–6.7	Chronic endocarditis. Protodiastolic.
6.	16	4	Anæmia. Protodiastolic.
7.	14–18	3.6	Anæmia. Protodiastolic.
8.	11	4	Pernicious anæmia. Protodiastolic.
9.	17–21	5	Myocarditis and endocarditis. Mesodiastolic.

In Table II, column I shows the time from the beginning of the auricular wave to the beginning of the wave that is synchronous with the carotid arterial pulse in the venous pulse tracing; the A-C time of Mackenzie. Column II shows the time from the presystolic wave crest to the beginning of ventricular systole.

The figures of Erlanger are taken from his recently published tracings taken from a practically exposed heart upon which receiving cups could be put over the left auricle and ventricle.[15]

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[15] Since this paper was written that of J. Pawinski, Die Entstehung und klinische Bedeutung des Galloprhythmus des Herzens (Zeitschrift für klinische Medizin, 1907, lxiv, 70), has come to hand. Here will be found, besides the author's views, an extensive discussion of the literature on gallop rhythm.

TOXEMIA FROM THE STANDPOINT OF PERVERTED METALBOLISM.

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This subject of toxemia has become, in recent years, of great importance. So varied are the conditions which, owing to vague etiology, have been classified as toxemic or toxic in character, that a brief discussion of a few of them seems not ill-timed. I cannot go into detail regarding many of these conditions, but must limit myself to these better known, leaving those of indefinite etiology with mere mention.

Definition. So uncertain have been the ideas regarding toxemia that it seems advisable, in the beginning, to define what is meant by this term. Toxemia is a condition characterized by the overloading of the blood with normal or abnormal products of food or tissue metabolism. This condition, therefore, is purely endogenous in character, and is sharply separated from those conditions associated with toxic symptoms due to exogenous products as well as from those toxemic states arising in the course of infectious diseases. Of course, the toxemia related to abnormal intestinal activity may be due to bacterial action to some extent, but the bacteria concerned in such processes are normal habitants of the intestinal tract, and may, therefore, be considered aside from those producing the acute infections. Toxins elaborated by the activity of specific microörganisms upon the various classes of tissue of the body, cause, oftentimes, such an intense poisoning of the system that death results, but this specific toxemia is not under discussion in this paper. Time will not permit a differentiation, both chemical and pathological, of these two types of toxemia; I can do no more than refer to the fact that in all infectious diseases specific toxic products are formed, the influence of which depends upon the resistance of the system as characterized by the presence and activity of antibodies, such as antihemolysins, antitoxins, anti-agglutinins, opsonins, etc. These subjects are becoming of prime importance in the study of infections, but are beyond the scope of this paper.

It should be further remembered that excessive normal or abnormal activity of one organ may so influence the activity of other organs that a toxemia may follow as a result of perverted secondary metabolism. The close relation or coördination of the various tissues of the body has been well treated by Starling in his assumption of the various "hormones."

Perverted Metabolism. Accepting, then, that the toxemia under discussion is endogenous in character, is usually non-bacterial, and is influenced by the inter-relations of the many organs of the body, is there any basis for the belief that it is due to perverted metabolic activity of any organ or group of organs? It is more or less common, in these days, to hear of intestinal, hepatic, renal, thyroid, orchitic, and other toxemias, as well as of those conditions occasionally accompanying more or less physiological states, such as pregnancy. It is evident, therefore, that such conditions are associated, in the minds of the profession, with abnormal activity of the organ in question. It is reasonable to suppose, and definite proof can be given, that abnormal activity, that is, perverted metabolism, of any organ results in the overloading of the blood with products which may, *per se*, lead to various symptoms of the toxemic type, or may so influence the activity of other organs that abnormal relations obtain. Moreover, the activities of many organs, depending as they do on the presence of certain substances elaborated by other organs, and passed by them into the blood stream, are influenced to abnormal activity by their absence, due to disease or to perverted metabolism of the coördinated organs. It is necessary, in support of this view, only to cite the influence of the thyroid, ovary, testicle, pancreas, suprarenal, and hypophysis on the general body functions. Remove them and the results are well known.

INTESTINAL TOXEMIA. In the study of this condition we have to consider several factors. It is evident that the activity of the intestinal juices is dependent on the quality and quantity of the food introduced, the quality and quantity of the intestinal juices, the power of absorption, and the motility of the intestine. Normally, no great variation in the decomposition processes, both those due to the intestinal ferments and those due to intestinal bacteria, is observed. Yet any abnormality in any of the factors above mentioned will lead to markedly abnormal decomposition processes. Thus the intake of an excessive amount of food or drink leads first to disturbance of the gastric functions, as shown by the symptoms of nausea and vomiting, and later to marked intestinal disorder, as evidenced by the symptoms of enteritis. While such disturbances do not, necessarily, lead to general symptoms, yet the common complaint of weakness, headache, rapid, weak pulse, etc., show that a general influence is present. Moreover, a direct effect upon the intestinal activity is observed after the intake of a large amount of food. The digestive powers of the juices are pushed to the limit to take care of the excess, but unless abnormal motility of the bowels is present, this excess cannot be handled. We thus observe an effort on the part of the bowel to overcome these effects. Diarrhœa, under these conditions, is a conservative process, since without it the digestive juices cease to act, according to the law that an accumulation of the products of activity of an enzyme will retard or prevent further activity. In case the motility of the bowel is normal, the food remains in a partly digested state, and is then subject to the activity of the bacterial flora of the intestines. Such latter activity is not the same as is that of the digestive juices, except to a certain degree, and abnormal products are formed. The ordinary processes which occur in the bowel abnormally are fermentation of the carbohydrates, putrefaction of the proteins, and conversion of the fats to lower fatty acids. Normally fermentation occurs in the lower parts of the small intestine, while the putrefactive processes take place, almost exclusively, in the large bowel. Occasionally we find these latter changes in the small intestine, and in such cases the decomposition products, as found in the urine, are much increased, owing to the greater absorptive power of the small bowel. It is clear that an abnormal condition of the digestive juices will lead to a lessened digestive, and, hence, to a lessened absorptive power of the bowels. Without such conditions food has little energy value, and symptoms of undernutrition slowly but surely supervene. I cannot discuss the metabolism of this condition, but I can say that perverted metabolism of all organs is present.

Toxemia of intestinal origin is due to the absorption of abnormal amounts of normal products or to normal absorption of abnormal products. By this I mean that excessive intake of food or deranged intestinal activity will lead, under certain conditions, to absorption of large amounts of the products normally or abnormally present. This excess taxes the liver in its effort to convert the nitrogenous products into urea, in its effort to elaborate the carbohydrates into glycogen, and in its attempt to furnish sufficient bile to permit of the absorption of the fat. Failing in this, the liver must allow the excess to pass from it in the unelaborated state. Such a condition overloads the blood with purin bodies, with amino-acids, with sugar, and with other substances, which exert toxic effects on the system, in case the accessory organs are unable to handle them. I cannot discuss the influence of excess of uric acid or of sugar in the blood beyond the statement that well known conditions arise from such an excess.

It is, however, with the abnormal decomposition products of intestinal activity with which I desire to deal in this discussion. Where can we draw the line between normal and abnormal decomposition in the bowel? That the products formed may exert some toxic action on the system is true, but we must not exaggerate these influences. We are indebted to Bouchard for the doctrine of intestinal auto-intoxication, and, since his publications, a general belief has prevailed that decomposition in the intestines plays a large role in the production of disease and errors of metabolism. The question is very apropos, To what extent and under what conditions may normal products of putrefaction and fermentation cause disease? The number of putrefactive products which occur in the intestine only under pathological conditions, and to which any toxic action can be attributed, is remarkably small. Skatol, indol, etc., may cause headache, neuralgia, neurasthenic symptoms, etc., yet, as Rovighi has shown, symptoms of poisoning are evident in dogs only when 1 gram per kilo is injected. The production of acetone and diacetic acid in the bowel has been assumed by Peters, Litten, von Jaksch, Lorenz, and others to be a sign of intestinal intoxication leading directly to a state of acidosis, which markedly affects the general metabolism. Keller, Pfaundler, Czerny, and others have made this condition accountable for the cyclic vomiting in children. We now know that, although these acetone bodies are formed to some extent in the bowel, yet they occur as common accompaniments of starvation, especially as regards the carbohydrate foods. Ptomaines, such as putrescin and cadaverin, have been found in the urine and feces by Udransky and Baumann, Stadthagen and Brieger in cases of cystinuria, which were associated with abnormal protein decomposition. It is quite possible, when the true nature of this disorder of metabolism is known, that these substances may be found to be derived from abnormal tissue metabolism and not from that of food products.

The subject of the influence of these decomposition products on general metabolism is still an unknown field. Little is found as to the effects of such substances. While it is true that abnormal decomposition in the intestine is associated with abnormal products, yet none of these products, so far isolated, has been proved sufficiently toxic to account for the general effects of such disturbances. It seems to me that the results observed following intestinal disorders are to be explained by the effect of the products of abnormal decomposition upon the metabolism of other organs rather than by the direct effects of the products themselves. The question of intracellular activity is more fertile, in my opinion, as a field of research than is the constant study of the products of bowel activity. No question can be raised that intestinal toxemia occurs, but its causation is still unsolved. It may be that some product, at present unknown, may be found that is sufficiently toxic to account for the effects, yet the secondary metabolic effects seem to me the more plausible.

Hepatic Toxemia. The liver, owing to its many functions, is one of the most important organs of the body. While its secretory activity is confined to the elaboration of bile, its so-called internal secretory functions are of great influence upon the general metabolism. It is in the narrow space of the liver cell that we find localized the formation of glycogen from sugar, the conversion of the amino-acids and ammonium compounds into urea, the neutralization of extrinsic and intrinsic toxins, the conjugation of aromatic bodies with sulphuric and glycuronic acids, as well as the storing up of fatty acids and soaps. Any disturbance in any of these functions is promptly felt by the system as a whole.

In the discussion of toxemia of hepatic origin I shall not consider the toxic effects due to stagnation of bile. The formation of bile is a specific vital function of the liver, and it is self-evident that its involvement or abolition, as a result of pathological changes in the organ, cannot continue without severe reactions upon the system in the sense of an auto-intoxication (Weintraud). Such metabolic results of jaundice of short or of long standing are too well known to require elaboration. The bile acids, with their known effect of producing hemolysis and slowing the pulse, will likewise be passed over, as such activity is not due to a direct disturbance of metabolism, but rather to a specific action of these compounds. While it is true that jaundice, acute yellow atrophy, cirrhosis, phosphorus poisoning, etc., have definite influence upon the local and the general metabolism, yet in this discussion I do not have reference to specific disease of the liver, but rather to the toxemia as a result of insufficiency of this organ. It may be said that there are no functional disturbances of the liver cells that are pathognomonic of absolutely definite changes in the hepatic parenchyma. As every disturbance of the activity of the cells influences the proper performance of other functions, a number of phenomena are combined in this symptom-complex of hepatic insufficiency.

One of the most important functions of the liver is its antitoxic power. As Weintraud has well said: "The antitoxic functions of the liver may be, to a great extent, comprehended by recognizing a protective action in each of the numerous metabolic indications by which the functional activity of the normal liver cell manifests itself, and by seeing an intoxication in the disturbance of these functions. At all events, the normal composition of the tissue juices is altered, and they depend upon hepatic integrity for their adequate maintenance. Just as the synthesis of urea from the toxic ammonia permits the harmless urea to be excreted, so the formation of glycogen from the carbohydrates prevents an overloading of the system with glucose. The poisonous products of digestion of protein are converted, during their passage through the liver, into non-toxic compounds, while the free fatty acids and soaps, which arise in intestinal digestion of fats, and which are toxic in large amounts, are retained and stored up in the liver. The formation of bile likewise frees the body from other injurious products of cell activity." Although there may not be enough constancy in the so-called hepatic insufficiency to warrant the assumption of a clinical symptom-complex, yet there are many evidences of this condition, which lead us to believe that a toxemia may arise from such a source. Few of the tests advanced as diagnostic of such a condition have stood the fire of criticism, but the finding of Strauss, that levulosuria follows the ingestion of 100 grams of levulose during fasting, has remained fixed.

While it is difficult to say just how far other organs may be functionally influenced by the toxic action arising from disturbances of the liver, there can be little question that certain toxemic symptoms may be manifested by disorder of any of the hepatic functions.

Although I cannot go into a discussion of the hepatogenous form of diabetes, due to the insufficiency of the liver to handle the sugar brought to it by the portal vein, or of the various disorders related to the so-called uric acid diathesis, yet these should be borne in mind. It is evident that any perversion of the normal functions of the liver will lead to the accumulation of abnormal products. Normally, autolytic processes are going on in the liver cells, which result in the formation of definite products. These are rendered inert by the same liver cells that produce them. In other words, the liver cell is capable of breaking down and resynthesizing its own constituents. These autolytic products are, as Magnus-Levy has shown, of the acid type, and pass into the circulation unmolested, providing the liver is not capable of exerting a sufficient antitoxic effect. Thus arises a condition of acidosis, whose influences are fairly well known. It is not to be understood that the liver, under abnormal conditions, is the only seat of formation of such bodies, but it is one of the most important. Usually the pathological changes associated with such processes are fatty in nature, as evidenced by the fact that in phosphorus poisoning, acute yellow atrophy, and delayed chloroform poisoning, fatty degeneration of the liver is associated with an increased output of amino-acids and acetone bodies.

A second series of changes which give rise to signs of hepatic toxemia are those associated with disturbance in the conversion of amino-acids, etc., into ammonia, and thence into urea. Here we find an ammoniemia along with irregular autolysis, leading to an increased acid formation either of the amino or oxy series. This condition is quite distinct from that discussed above and has a separate function of the liver to deal with. The combination of these two conditions has lead to the assumption by Croftan and others that the liver is more at fault in the causation of uremia than is the kidney. Yet we must remember that were the kidneys not involved uremia would not occur, although symptoms somewhat resembling it may obtain. The general metabolic effect of such a condition is more in the foreground in such cases than is the hepatic or renal disorder, yet the hepatic insufficiency is, in some degree, accountable for the overloading of the system with such products, while the renal insufficiency prevents their excretion.

Another class of hepatic toxemias is found in a low-grade infection of the gall-bladder. I have recently seen, through the courtesy of one of our leading physicians, a patient who had been treated for ten months for dilatation of the heart without the slightest effect. Indeed, the trouble had progressed. On simple drainage of the gall-bladder, although no symptoms pointed to this organ, the cardiac symptoms became better, and within a few days had almost subsided, the heart being reduced to about normal size. This points, it seems to me, to some obscure toxemia, with the gall-bladder as its source. As the bile excretes many of the toxic substances carried to the liver, it seems rational to suppose that, through some perversion of metabolic activity, such products, possibly of bacterial origin, were either not excreted into the bile, but were passed into the circulation, bringing about a toxemia, or, being excreted, a low grade inflammation of the gall-bladder ensued, which may have induced the condition found. We all know that the myocardium is extremely sensitive to untoward influences, so that the above assumptions do not seem far-fetched.

We must grant, therefore, that many metabolic perversions of the liver may lead to definite toxemia, although this may not always be manifested by a clear etiology. Certain it is that some of these toxemias of hepatic origin are associated with urinary and blood findings, which are not, it is true, pathognomonic, but do point to the probable source of the trouble.

Renal Toxemia. That toxemia of renal origin occurs is unquestioned, but the cause of such a state is unknown. All gradations of such intoxication, from the intense acute uremic state to the slow chronic form, are observed. The theories advanced regarding the causation have for the most part as a basis the idea of overloading of the blood with urinary constituents as a result of an insufficient kidney. Opposed to these theories are those that hold that hydremia, with resulting œdema of the brain, is at the bottom of the symptomatology. These latter ideas are especially advocated by Rees and Traube, but do not seem convincing, inasmuch as certain factors assumed by the advocates are at times missing, and hence cannot be regarded as causative in all cases. We all know that retention of almost every constituent of the urine has, at one time or another, been held to be the etiological factor in uremia. One by one these substances have been abandoned, until now we cannot grant that anyone is specific in the causation of this group of symptoms. From the time that retention of urea was advocated by Wilson until the list had been exhausted by Bouchard in his assumption of organic urotoxins, we have been obliged to change our ideas of the factors responsible for this trouble. Opposed to these views are those of Frerichs, Demjankow, and the closely related one of Treitz, which assumes an ammoniemia as the causative agent. Strauss found that ammonia was increased in the blood, but at the same time nitrogenous bodies, other than albumin and urea, were present, which must play a role in the etiology. He shows that, while the salt content of the serum in uremia does not change, the amount of nitrogenous constituents contained in the hydremic serum, that is, the retention nitrogen, is, as a rule, increased to a great extent. In connection with this work of Strauss one must mention the findings of Gumlich and Richter, that ammonia, alloxur bodies, and extractives were markedly increased in the urine of uremics. As von Noorden states: "A thorough inquiry into the localization of these substances and into their toxic action in cases of renal insufficiency is much needed. It will also be necessary to ascertain how and to what extent glands, such as the thyroid and suprarenals, react to the intoxication; whether by insufficient or excessive secretion, or by the production or neutralization of the products of metabolism. When we are acquainted with all the factors which probably go to determine the appearance, progress, and prevention of uremia, it will no longer seem strange that it cannot be correctly estimated or adequately explained either by the deficit in the metabolic balance or by quantitative analyses of the blood." It is certain that no definite explanation of this toxemia can be given at present, although many attempts have been made to account for it.

It is well known that complete anuria may obtain and yet no symptoms of toxemia be present. This should prove that it is not alone the retention of waste products that brings about this syndrome, but rather some unknown influence acting upon the general or special metabolic activity. Toxemia of renal origin surely, is a clinical entity, but just what the mechanism of the process is is still unsolved. It may be that the little understood secretion of the kidney may be at fault, but until more is known regarding this speculation is superfluous.

THYROID TOXEMIA. The thyroid is of great importance in the general metabolic activity of the system. When this organ is lacking, owing to disease or to removal, a marked lowering of the general energy relations ensues, while in cases in which its function is exaggerated a great increase in the total consumption of energy is noted. There is no organ, with the possible exception of the working muscle, which exerts such an influence on the energy relations as does the thyroid (Magnus-Levy).

The thyroid excretes in its colloid substance an active product, thyreoglobulin, which is combined with the specific iodothyrin. This substance is, no doubt, the one to which a great deal of the influence of the thyroid is due, yet no absolute data bearing on this are at hand. The internal secretion of the gland finds its way through the lymph stream into the blood, whence it passes to the various organs upon which its influence is exerted. It is known that definite signs of toxemia follow both the excessive and the deficient action of this organ. It is necessary only to cite the symptoms in a well marked case of Basedow's disease, such as hyperidrosis, exaggerated reflexes, restlessness, tachycardia, tremor, etc., as well as those of myxœdema or of cachexia strumipriva, to carry my point. Just what are the etiological factors at the bottom of these conditions is unknown, and it seems useless, in the present state of our knowledge, to speculate. Two theories have been advanced to account for the action of this gland, but neither seems convincing. The first, the so-called secretion theory, is that failure of the internal secretion of this gland causes not only quantitative but also qualitative changes in the metabolism, so that poisonous products appear which either do not obtain normally, or are "disintoxicated" by the thyroid secretion. The second theory, the so-called antitoxic theory, varies from the first in that the antitoxic action takes place in the thyroid itself through the influence of the specific iodothyrin.

This internal secretion of the thyroid is known more by its effects than by its properties after isolation. Even the iodothyrin is not a definite chemical entity, as it has been shown to have varying amounts of iodine. That excessive activity leads to different results from deficient function is evident, yet the variations may be more quantitative than qualitative.

Many other conditions, which may be classed as toxemic, are observed following perverted metabolism of the suprarenal glands, of the hypophysis, of the ovaries, and of other organs. The symptoms of such toxemias are not so well marked, in all cases, that an absolute diagnosis may be established, yet the etiological factor at the bottom may often be discovered by careful consideration of the normal functions of the various organs mentioned. It is true that the function of some of these organs is unknown, and that their internal secretion is even more obscure, yet we may hope that research will unravel these mysteries and throw a definite light on the origin of these obscure toxemias.

Conclusions. Toxemia, aside from that following the acute or chronic bacterial processes, is always of metabolic origin. The toxemias under discussion are more the effects of a general metabolic perversion than of a direct organic disorder. A specific toxemia, in the sense that it is due to a specific substance, is unknown in the class of toxemias discussed.

THE RELAXED KNEE-JOINT.[1]

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During the last few years great advances have been made in the diagnosis of the non-tuberculous chronic joint diseases, and, in consequence thereof, in their treatment. These advances have been made possible by the use of the Röntgen rays, by the laboratory study of diseased joints, as well as by the material obtained by operations. Indeed, these operations themselves have been the source of much enlightenment. We have learned thus to distinguish and to recognize the clinical meaning of the different forms of infectious arthritis and to separate the hitherto confused forms of chronic atrophic and hypertrophic processes in the joints. The significance and importance of the hypertrophied joint villi have become clear to us, both in their role of secondary factors and as the primary source of joint disturbance. At the same time there still remains a not inconsiderable number of cases that clinically cannot be included in any of these groups; they present no radiographic abnormalities, they are not infectious in their nature, and objectively they fail to give clinical evidence of enlargement of the joint villi. It is to some of these cases that I would for the present ask attention. In my own experience they concern altogether the knee-joint; they have been most often alluded to under the caption of "functional" affections, and they have been described by some excellent authors as joint neuralgias. Some of them, and not an inconsiderable number, are found to be the expression of joint strain and disturbance due to loss of the static equilibrium at the ankle and in the foot, the remoter results of the weak and flat foot. That such knee symptoms, and even organic change of temporary character, may be the clinical manifestations of weak and pronated feet in the complete absence of subjective symptoms attributed to the feet, it has been my privilege to point out in a former paper.[2]

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[1] Read at a meeting of the Southern Surgical and Gynecological Association, New Orleans, La., December 18, 1907.

Etiologically considered, the cases with which I am especially concerned appear to divide themselves into two groups, according as they are thought to be the more or less direct result of trauma or not. They are also divisible into two classes according to the nature of the symptoms presented. In the one there is complaint of joint pain, altogether or largely dependent upon the function of the joint; the pain is for the most part referred to the front of the joint, frequently under the patella. Ascending or descending steps is usually described as particularly painful, and after prolonged walking and standing, pain may continue for some time after the joint is at rest. So, too, after unusual use of the joint serous effusion may ensue, to disappear promptly after abstaining from use for a while. In the second group of cases the patients come with a recital of symptoms which are frequently remarkably like those of injury to a meniscus. They are characterized by the occurrence of attacks of very sharp pain, immediately followed by complete loss of strength in the joint, so that the patient often falls; upon moving the joint a few times the pain commonly disappears, but is followed by the development of an effusion into the joint. After a few days of joint soreness and sense of insecurity, the effusion vanishes and an interval of comparatively normal function ensues. Since these attacks usually happen in the absence of the surgeon, and since they are ordinarily of short duration, there is not seldom doubt as to whether actual "locking" of the joint has occurred. In only two instances have I been able to witness the attack itself, and in both of these I was able to decide that the joint was not locked, but simply held rigid, because of the exceedingly intense pain. For the most part, in my cases, these attacks have not come on during considerable exertion, but rather when the patient was standing, off his guard, and with attention concentrated upon some occupation. In one of my most characteristic cases, that of a young woman, the attack occurred a number of times while dressing the hair.

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[2] Cleveland Journal of Medicine, July, 1901.

If, in either of these groups of cases, the joint be examined in the interval between attacks and at a time when effusion is absent, a condition will be found that is so nearly normal that it is likely to be pronounced so unless the examiner has put been on his guard by the history and by his familiarity with its meaning. There is no swelling; tenderness may be entirely lacking or confined to a circumscribed space in the joint line, and thus easily overlooked; the excursions of the joint are normal and painless; and *x*-ray photograms are absolutely negative in showing any abnormal condition. There is none of the grating so characteristic of villous hypertrophy in the most typical of these cases; it is found not infrequently, however, and must then be looked upon as the indication of such enlargement of the villi as a secondary process.

That which is characteristic of the cases under discussion is an atrophy of the quadriceps extensor of the thigh, a shrinkage in volume which is usually to be perceived by the eye if looked for in comparison with the other limb, and certainly to be ascertained in more definite terms by the use of the tape line. In this quadriceps atrophy and the weakened power of extension caused by it, we have then the chief mark of the joint condition from a clinical standpoint; but it is also explanatory of the pathology of the affection and of its etiology. In my cases the difference in circumference of the thigh just above the knee has varied from $\frac{1}{2}$ to 1 inch. In several cases the circumference of the calf was also less than that of the normal side. In the greater number this was, however, not so. It is necessary to be accurate in the method of measurement in order to avoid self deception, particularly so in attempting to estimate the influence of treatment. On account of the conical shape of the thigh, the measurement must be made at precisely the same level on both sides if error is to be avoided. I accomplish this by having the patient stand before me; a carpenters' level being held against both thighs, with the spirit bubble centred, a horizontal mark is made at exactly the same height on both sides, with a skin pencil. The level being put aside, the circumferences are now taken, the tape being each time adjusted to an equal degree of tension. In this manner all practical error may be avoided.

Having recognized the atrophy of the quadriceps as the one external physical sign of this joint affection, it requires only a thought of the physiology of the knee-joint to explain the symptoms. The quadriceps is normally the "tensor" of the knee-joint capsule. In its atrophied and therefore weakened condition it fulfils its duty in this respect so imperfectly that, instead of being held taut to the normal extent, the capsule remains relaxed during movement, and is thereby subjected to repeated traumatisms by getting squeezed and pinched between the femur and the tibia. It is natural to expect the character of the symptoms to depend upon the degree of relaxation, and therefore upon the extent to which the capsule falls into folds. If, as is likely in the absence of correct diagnosis and proper treatment, this condition exists for a considerable length of time, the repeated traumas followed by inflammatory reactions are likely to produce a chronic state of hyperemia in the joint capsule; this, in turn, causes the enlargement of the fat tabs of the joint, and the so-called villous arthritis, with its characteristic grating, is before us.

Granting that the existence of the quadriceps atrophy is recognized and its role in producing this symptom-complex acknowledged, the question of its cause becomes uppermost. In several of my cases the history of trauma to the joint was evident. In 4 of my cases, however, the patients denied having suffered injury to the joint until I insisted upon the importance of apparently slight trauma. In all of them I was then finally able to determine a traumatic factor: a severe bump against a chair, a bruise, a twist of the knee at playing hand-ball, a fall upon the bent knee. I therefore look upon this atrophy as due to trauma of the joint, or at least in its neighborhood, and I believe, at the same time, that my cases furnish evidence of the reflex nature of this atrophy. This is the more interesting since experiments upon animals have recently caused Bum,[3] Firgan,[4] and others to favor the theory of "inactivity." However, in view of the fact that in several of my cases the limb was used in the ordinary manner without intermission from the time of injury, the conclusion seems permissible that not only must the atrophy have been of reflex origin, but also that trauma of comparatively slight degree is capable of bringing this about. I am strengthened in this belief by cases of very similar kind reported by Paalzow,[5] Caspari,[6] Heidenhain,[7] and Hoffa.[8] I shall abstain from further discussion of the manner in which this reflex atrophy is produced, as being unfortified to a sufficient extent by facts, and therefore of too purely theoretical interest.

In hospital and private practice I have been able to observe 9 patients whose clinical symptoms I have attempted to portray in the foregoing description. I shall omit the narration of the case

[3] Zentralbl. f. Chir., 1905.

[4] Archiv f. Unfallheilk., Band ii, p. 167.

[5] Deut. militärärztl. Zeitschr., 1899, Heft 4.

[6] Archiv f. Unfallheilk., Band i, p. 219.

[7] Monatsschr. f. Unfallheilk., 1894, Nr. 12.

[8] Therapie der Gegenwart, 1903, 1.

histories, as adding nothing to the value of this report. As the result of this experience, however, I feel justified in advocating the description of the relaxed "knee-joint" as a distinct syndrome, and not simply as a feature or variety of villous arthritis. On the one hand, a number of these cases of relaxed joint fail to present evidence of villous enlargement at any time; on the other hand, villous enlargement is very frequently seen as a manifestation secondary to joint inflammations of various kinds, and even to tuberculous disease.

In view of the fact that muscular atrophy is so frequently the accompaniment of chronic joint disease, but especially since the trauma causing the muscular shrinkage may have done deeper damage to the joint, even to the extent of injuring a meniscus, it may be surmised that accurate diagnosis is frequently far from easy. The hope that the newer method of examination by the x-rays after distention with oxygen gas would enable us to determine accurately an injury of the meniscus, has also proved to be vain. Wollenberg[9] has come to this conclusion after exhaustive experiment. In my experience, the most valuable point in distinguishing between the relaxed knee and that with injured meniscus is the fact that in the latter condition the subsidence of joint disturbance between attacks is likely to be incomplete; some swelling of the capsule is likely to remain, and some limitation of motion at the extremes is nearly always present. That these conditions will be found in long-standing cases of relaxed knee as the result of secondary villous hypertrophy is self-evident, but here we have also the physical evidences of villous overgrowth. From the foregoing it must be apparent that occasionally exact diagnosis is a matter of no mean difficulty, and calls for nice judgment. It is preëminently a diagnosis "by exclusion."

TREATMENT. Having accepted the foregoing explanation of the nature of the joint symptoms under discussion, the therapeutic indications would seem to be clear enough. If the atrophy of the quadriceps and the relaxed condition of the joint capsule are responsible for the symptoms, vigorous measures toward restoring the muscle to its normal strength and volume, toward improving the circulation in the capsule itself, must result in bringing about normal conditions again. Accordingly, we should devote ourselves to an energetic course of treatment by gymnastics: resisted extension of the leg upon the thigh, exercises upon suitable apparatus looking toward the development of the quadriceps in particular, faradic stimulation of the muscle, vibratory or manual massage, alternate hot and cold douches, etc. When by these means we have succeeded in restoring the volume of the muscle to the normal, the symptoms will have disappeared. Usually this will be accomplished in from six to ten weeks; having instructed the patient to continue some simple home exercises for a longer period, he may be practically dismissed from treatment. In some cases, however, the recovery is not so simple nor so rapid. Despite our best efforts, the return in strength and volume of the extensor is so slow as greatly to try the patience of the patient and the faith of the surgeon in his diagnosis. This has also been the experience of others. It has furnished ground for the theory that injury of considerable moment has been done to the spinal centres. Caspari is inclined to lay stress upon the effect of concussion, at the time of injury, upon the central nervous system. One of my cases would seem to lend strength to this view, since the patient, who was a locomotive fireman, was injured in a wreck and gave every evidence of having sustained damage by great violence. Two of my patients were pronounced neurasthenics before the injury, which might thus have acted upon a nervous system which was more than commonly susceptible. These 3 patients were the ones in whom the recovery was more than ordinarily slow, requiring in one case a period of six months. However, in all of my cases complete and lasting recovery ensued by persistent use of the methods above mentioned, aided in some by measures looking toward improvement of the general health. The rather common practice of ordering elastic bandages and knee-caps for these cases is to be deprecated; it can only serve to delay the disappearance of the muscular atrophy.

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[9] Zeitschr. f. orthop. Chir., Band xix, p. 253.

In summarizing, it seems fair to say:

1. Many cases of so-called "functional" knee symptoms are due to reflex atrophy of the quadriceps extensor muscle following injury.
2. The term "relaxed knee-joint" should be reserved for such cases.
3. The injury may be so slight that its etiological relation may be overlooked.
4. The atrophy following in many cases cannot be explained by the theory of "inactivity."
5. In the cases under discussion, the cure will be brought about by the restoration to normal volume and strength of the quadriceps extensor muscle.
6. In some cases the recovery is so protracted as to warrant belief in material damage to the central nervous system.
7. While in such cases our endeavors are necessarily limited to treatment at the periphery, ultimate recovery may be expected to follow persevering and well directed effort.

PRIMARY COLLOID CARCINOMA OF THE VERMIFORM APPENDIX.[1]

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The specimen presented was obtained August 15, 1907, at an autopsy on a subject dead of acute intestinal obstruction. The cause of obstruction was determined only at the autopsy, and had no bearing on the condition found in the appendix.

The patient was an old woman, aged seventy-five years, who up to the time of the acute symptoms had been going about in apparently good health. There was no family history of tuberculosis or cancer. Thirty-five years previously she had had a severe attack of "inflammation of the bowels," evidently an acute appendicitis, as was shown at the autopsy. Two years ago she had an intrascapular fracture of the right femur, but had made a good recovery. During the past three months she had lost considerable weight—she thought about fifteen or twenty pounds—but had not felt any ill effects, nor had any cause been found for this disturbance in nutrition. There had been some constipation, but not sufficient to attract serious attention, and no blood or other unusual features had been noticed in the stools.

The acute illness in itself was of considerable interest. Briefly, there had been an acute attack of abdominal pain, with vomiting, followed by symptoms of partial intestinal obstruction for five days, with but little constitutional disturbance. No cause of obstruction was found on physical examination, and conditions did not justify an exploratory laparotomy. On the sixth day obstruction became complete, and the constitutional condition was extremely bad from that time until death, on the ninth day of illness.

At autopsy the obstruction was found to be due to a Richter's hernia of the small bowel into the right femoral ring (Fig. 1). The portion of bowel involved was only a short distance above the ileocecal valve. The peritoneum generally was free from adhesions.

The appendix was found lying deeply and bound down to the posterior wall of the abdomen by dense adhesions. Its direction was inward and backward along the brim of the pelvis. It was about two and a half inches in length; the distal portion had undergone a symmetrical overgrowth to the diameter of half an inch. Only about half an inch of the proximal end remained free from overgrowth (Fig. 2). The appendix was white in color, with numerous small vessels showing prominently on the surface. On palpation, it was quite hard. On section, the growth was white and dense in the outer part; the central portion contained a white colloidal material. The cecum and other portions of the gastro-intestinal tract showed no sign of overgrowth. A single gland at the angle of the cecum and ileum was enlarged to the size of a cherry and hard; no other mesenteric glands were enlarged, and there was no metastasis in the liver, spleen, or kidneys.

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[1] Read at a meeting of the Montreal Medico-Chirurgical Society, October 4, 1907.

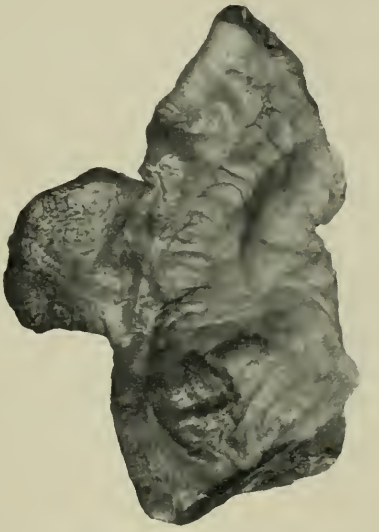

FIG. 1.—Richter's hernia of the small intestine into the right femoral ring.

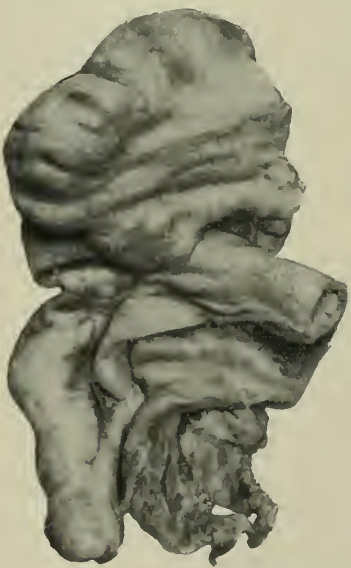

FIG. 2.—Carcinoma of the vermiform appendix.

Sections of the appendix showed marked irregular overgrowth of the epithelium invading all the deeper tissues. The masses of new-growth in most places had undergone a complete colloidal degeneration, but in some parts typical glandular carcinoma formation was seen, the glandular epithelium being greatly proliferated and invading the tissues below the basement membrane. Other portions showed masses of irregular epithelial cells, with the colloidal changes not so extreme. Sections of the mesenteric gland showed the glandular tissue replaced by irregular masses of epithelial cells, for the most part showing extreme colloidal degeneration.

The specimen is of interest chiefly as a pathological rarity. In 1900 A. O. J. Kelly[2] collected 20 cases, and in 1905 was able to increase the number to 40.[3] Elting[4] collected 43 cases, but admits only 23 as undoubted instances of the condition. In 1906 Rolleston and Jones[5] published a very valuable study of 42 cases of undoubted primary malignant disease of the appendix, of which 37 cases were examples of different types of carcinoma. Many of the cases were only discovered in the routine examination of appendices removed at operation.

THE MANAGEMENT OF LABOR IN MINOR DEGREES OF PELVIC CONTRACTION, WITH SPECIAL REFERENCE TO THE RELATIVE INDICATIONS FOR ABDOMINAL CESAREAN SECTION.[1]

A TABULATED REPORT OF EIGHTEEN CESAREAN SECTIONS.

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For a long time the maternal mortality of Cesarean section was so high that the operation was considered one of last resort. The death rate ran from 50 to 60 per cent., and Budin made the statement that not a single successful operation was performed in Paris from 1787 to 1876. Harris published statistics of the result in this country which discouraged anyone from undertaking the operation, and reported 11 operations in New York, with 10 deaths. The improved technique inaugurated by Sanger twenty-five years ago, however, placed the operation on a different footing. Under the new conditions, that have since obtained, the borderline between absolute and relative indications has been changed and increased about 2 cm. In 1901 Williams,[2] of Baltimore, advocated that the absolute indications be changed from 5 to 7 cm. in the justominor pelvis, and from 5.5 to 7.5 cm. in the simple flat pelvis. This proposition has been endorsed by Webster, Jewett, and Edgar. Dorland and Hirst make it 6.5 cm.; Peterson, 6.2 cm. Edgar makes a distinction between the presence of a living and a dead infant, the absolute indications being 7.6 cm. and 6.3 cm., respectively. The relative indications run from these minimal diameters up to 8.5 cm. in the simple flat, and 9 cm. in the justominor pelvis. Above these measurements it is generally conceded that a living infant can be extracted through the natural passages.

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[2] Proc. Path. Soc., Philadelphia, 1900, p. 109.

[3] Treatise on Appendicitis, by John B. Deaver, chapter on Pathology, third edition, 1905, p. 143.

[4] Annals of Surgery, April, 1903, p. 519.

[5] Amer. Jour. Med. Sci., 1906, cxxxi, 951.

[1] Read at a meeting of the Southern Surgical and Gynecological Association, New Orleans, December 17, 18, 19, 1907.

All operators recognize the importance of early surgical interference before the woman has gone through the exhaustion of prolonged labor pains, and particularly before employing forceps and manipulations that may produce infection.

Reynolds,[3] of Boston, in a valuable paper, has classified Cesarean sections as primary, secondary, and late. The primary include cases operated upon just in advance of the time of expected labor; the secondary, those performed after a few hours of labor; and the late, those performed after labor has been allowed to go on for some time, and when it has been clearly demonstrated that the natural forces cannot overcome the obstruction at the pelvic inlet. He reported 289 operations during the last ten years by twenty different operators. The mortality in the first class was 1 death in 82 cases (1.2 per cent.); in the second, 158 cases, with 6 deaths (4 per cent.); and in the third, 49 cases, with 6 deaths (12 per cent.). The death rate was clearly proportionate to the duration of labor before operation.

Some obstetricians object to elective Cesarean section because they fear that defective drainage through the undilated cervix will give rise to infection. On that account they prefer to let the first stage progress far enough to open the cervical canal. All agree, however, on one point, and that is, not to let the labor progress until the woman is exhausted or infected. A high mortality and discredit to the operation are the result of its performance under opposite conditions.

To see the cases early, to recognize the possible necessity for Cesarean section, and to conduct the labor accordingly are the great needs of modern obstetric surgery. A large proportion of obstetric work falls into the hands of the general practitioner, and it behooves him to rise to the occasion and to recognize early the cases of disproportion between the infant's head and the maternal pelvis. Too often he fails to do this until the situation is forced upon him by a long and exhaustive second stage, or, still worse, after the injudicious and fruitless use of forceps. The life of the infant is then seriously jeopardized, and the time for a successful Cesarean section is passed. The general practitioner is now more familiar with the symptoms of ectopic pregnancy, and his prompt diagnosis saves many lives; he should be equally wide awake to recognize pelvic deformity. First, he should be taught the frequency of the existence of pelvic deformity, and the importance of pelvimetry; and second, he should make it a rule of practice to examine all pregnant women by palpation and pelvimetry in the last month of pregnancy.

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[2] Trans. Amer. Gynecological Society.

[3] Ibid., 1907.

It is the common belief that pelvic deformity is of infrequent occurrence. This is because the condition is overlooked. It is like the doctor who says he has been practising obstetrics twenty years and never saw a lacerated perineum. He has never looked for it.

Edgar says pelvic contraction is often found in women who frequent dispensaries and hospitals. It is true that it is more commonly found in this class, but the complication is not rare in the higher social scale. Modern social life tends to degeneration of the child-bearing functions. Dysmenorrhœa, sterility, undeveloped generative organs, mammary glands, and pelves are the evidences of ill equipment. The generative organs are the last to develop in the growing girl, and, unfortunately, the period of maturity coincides with the period of greatest nervous and physical strain. At this critical time the allurements of society entice the young girl prematurely within its toils. Williams estimates that every fourteenth white, and every sixth colored woman in Baltimore has a contracted pelvis. By far the most common types of deformity are the generally contracted and the simple flat pelvis. The relative frequency of these two types depends largely upon the class of women among whom one works.

Jewett says the simple flat pelvis is a common variety in Europe, but rare in America. Grandin and Jarman, on the other hand, state that the flattened pelvis is a type frequently found, while the justominor is of infrequent occurrence. My own observations, made in Washington, agree with those of Williams, Edgar, and Hirst, that the justominor is the prevailing type of deformity. Williams found it in one-third of all the contracted pelves occurring in the white, and in two-thirds of those in the black women. Hirst says the justominor pelvis is certainly as common in Philadelphia as the simple flat pelvis; and if one judges from hospital patients, among whom there is a large proportion of shop and factory girls, this variety of contracted pelvis would be regarded as the commonest. Dorland entertains the same views. Obstetricians living in the Southern States of this country, where there is a large negro population, find the generally contracted pelvis largely in preponderance.

Investigation by Dr. Edgar Snowden of the records of the Columbia Hospital gives the following results in 532 cases (white 131, colored 401):

	(Approximately) Per cent.
White, all the external pelvic diameters normal	53
Colored, all the external pelvic diameters normal	45
White, all the external pelvic diameters above normal	3
Colored, all the external pelvic diameters above normal	..
White, all the external pelvic diameters diminished	25
Colored, all the external pelvic diameters diminished	49
White, simple flat pelvis	20
Colored, simple flat pelvis	5

According to these figures the measurements indicating the simple flat type of pelvis occurred in 20 per cent. of the white, and only 5 per cent. in the colored women, while those pointing to the existence of a generally contracted pelvis occurred nearly twice as often in the colored women, being 48 per cent. and 25 per cent., respectively. It is not claimed that all of these women had simple flat and justominor pelves. The external conjugate measured less than 20 cm. in all; in some it was as low as 15 cm., and the other external diameters were correspondingly reduced. Owing to the varying thickness of the sacrum, the length of the external conjugate is not a reliable index of the length of the internal. A few centimeters more or less may not indicate anything. It is usually stated that when the external conjugate measures between 19 and 18 cm., the true conjugate will be shortened in 50 per cent. of the cases, and when below 17 cm. it is nearly always indicative of pelvic contraction. This is not true, especially if applied to the negro woman, in whom a normal diagonal conjugate is frequently found under these circumstances. It is a matter of common observation that an external conjugate of 19, 18, 17, or 16 cm. is found, and yet many of the women are delivered after a natural labor. One of two conditions exists: (1) The external conjugate is diminished, but the internal is normal. This is due to thinness of the sacrum, and is found in women who possess small structural development of the skeleton. (2) There is some diminution of the obstetric conjugate or of all the internal pelvic diameters, but nature takes care of these women by giving a small baby to pass through a small pelvis. The product of conception is small and the pelvis is small because of non-development of infant and mother. The relation between the diminished weight of the infant and the degree of shortening of the external conjugate diameter of the mother's pelvis is shown by the accompanying chart and is based upon the averages of 272 observations.

On the other hand, it is claimed that contraction of the internal conjugate is rarely found to exist when the external measures 20 cm. or more. In Case 18 of the series of Cesarean sections reported in this paper the external conjugate measured 20.5 cm. The other external diameters were also normal or above, and yet the woman had a contracted pelvis, with a true conjugate of 9 cm. (3⅗ inches). Another patient recently came under my observation with an external conjugate of 20 cm., and the woman had a true conjugate of only 7.5 cm. (3 inches). The interspinous was 25, and intercrestal 28 cm. The only external measurements to excite suspicion were the right and left obliques, which were 2 to 3 cm. short. At her first labor I effected delivery by symphysiotomy. One year later she entered the hospital at the seventh month of pregnancy in premature labor. The waters had escaped and the legs of the infant were in the vagina. Although a small premature infant, it was delivered dead by traction, aided by strong suprapubic pressure.

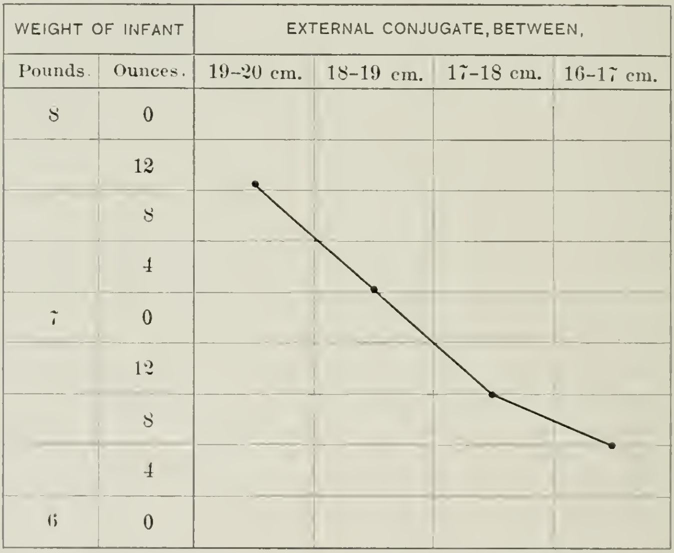

Chart illustrating the relation between the weight of the infant and the shortening of the external conjugate diameter of the maternal pelvis.

The importance of measuring the external oblique is not generally recognized. At the San Francisco Maternity the classification of pelves is based upon the length of these external diameters and the true conjugate. Another case illustrating the importance of the length of the external obliques was examined within the past few days. The woman had been delivered by difficult high forceps extraction twice, with both babies large and dead. She was five months pregnant with her third gestation when I examined her with her physician, Dr. D'Arcy Magee. All of the diameters were normal (including the diagonal conjugate) except the external obliques. The right was 20 cm., and left 19 cm. The internal obliques were clearly diminished by the encroachment of the iliac planes within the pelvic space. Between the spines, 24.5 cm.; between the crests, 25 cm.; between the tuber ischii, 11 cm.; external conjugate, 20 cm. This patient will be put on Prochownick's diet after the sixth month of gestation, and will be delivered by the induction of premature labor, or by Cesarean section at term early in April, 1908.

Pelvimetry should be performed at the eighth month of pregnancy in all primiparæ, and in those multiparæ who have passed through difficult labors. If neglected until the advent of labor, it should be done then in all cases when the head is high, and especially before any attempts are made to deliver by forceps. Shortening or disproportion of any of the pelvic diameters should always excite suspicion. One can clearly understand the importance of the practice of pelvimetry by all practitioners who undertake obstetric work. Unnecessary complications make it unpopular. Some of these are the useless refinements of the measurements, including small fractions of a centimeter or inch, and the many varieties of pelvimeters which claim to possess particular advantages for accurately measuring the diameters of the maternal pelvis and the fœtal head.

In minor degrees of pelvic contraction the length of the pelvic diameters alone is not all important; the size of the infant's head alone is not all important; it is the relative disproportion between the head and the pelvis. Can this head mold and pass through this pelvis? is the question to decide. The answer must be sought by the result of palpation. Palpation requires no complicated instruments, and a little practice enables one to obtain valuable information. By it the obstetrician can ascertian the size of the uterine tumor, the relative proportion of the contents—infant and amniotic fluid, and consequently can form a fairly accurate opinion of the size of the infant—whether small, of average size, or large. The position of the infant is made out, and, if it is a head presentation, whether or not the head is engaged within the inlet. If not engaged, can it be made to do so by pressure in the line of the axis of the superior strait? In a primipara the head should be always engaged, under normal conditions, and descended within the pelvic cavity after the eighth month of gestation; in a multipara, if disengaged and movable above the brim, it ought to engage by suprapelvic pressure, with or without anesthesia.

In minor degrees of pelvic contraction, discovered in the thirty-second week of pregnancy, modern obstetric practice points out three lines of treatment: (1) The induction of premature labor; (2) elective Cesarean section; and (3) delay until labor has demonstrated the resources of nature; then (*a*) spontaneous delivery; (*b*) version; (*c*) axis-traction forceps; (*d*) Cesarean section; (*e*) symphysiotomy or pubiotomy; or (*f*) craniotomy.

1. The Induction of Premature Labor. We must recognize that there is a slight increase of danger to the mother, and a very material risk to the infant, by this method. The earlier the interference is required the greater the risk to the infant; therefore, the

inducing of premature labor is not justified before the completion of the thirty-sixth week of pregnancy, unless the mother has previously given birth to very big babies. Beginning at the thirty-second week, the case should be tested weekly to see that the head can be pressed down into the inlet. If it can be carried on in this way to the thirty-sixth or thirty-seventh week, labor may be induced. If engagement cannot be made successfully before that time, it is not, as a rule, a proper case for the induction of premature labor. If the disproportion be decided, it is a case for elective Cesarean section; if not decided, it may go to full term, and after labor pains have been in progress for several hours it may still be a proper case for section, unless there is good assurance of a successful delivery through the natural passages.

Whether labor has been induced or is spontaneous, the case should be conducted along such lines that the patient will be in a favorable condition for Cesarean section. should it prove advisable. Few examinations should be made, and these with the most rigid aseptic precautions.

In case molding and engagement have occurred, and the conditions give promise of a successful forceps delivery, the woman should be placed in the Walcher position and the instruments employed. If failure results, and the efforts at artificial delivery have not been protracted, the course of action must be guided by the condition of the infant. If its life has been seriously jeopardized, or if destroyed, craniotomy is indicated. If the heart-sounds of the infant be good, and there is hope of saving it, symphysiotomy or pubiotomy is called for.

2. Elective Cesarean Section. When the disproportion between the diameters of the fœtal head and the mother's pelvis is decided, and the head cannot be forced into the inlet by pressure under chloroform, the chance of a successful delivery by the natural passages is so small that Cesarean section should be performed at a period shortly anticipating full term. The best results of the operation are obtained in these cases. If the os be patulous, no trouble will be met with from deficient drainage; if not, it may be dilated from above downward and a gauze drain inserted. Others might prefer, under the latter circumstances, to wait long enough for labor pains to effect some dilatation. My first Cesarean section was performed in 1890.[4] On the fifth day the temperature rose to 101.5°, and the lochia had a bad odor. The cervix was small and the os closed. The canal was dilated with steel instruments, the uterine cavity explored and washed out with a 2 per cent. solution of carbolic acid. The immediate effect of the manipulation was to increase the temperature to 104°; it fell to 99.8° that evening, and then remained normal.

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[4] Trans. Amer. Gynecological Society, 1890.

3. Delay until Labor Has Demonstrated the Resources of Nature. This course should be pursued when the disproportion is not great and there is good ground to hope for delivery by the natural passages.

(*a*) In the most favorable cases spontaneous delivery will take place. In minor degrees of pelvic contraction it has occurred in two-thirds of the cases. Molding, engagement, and descent of the head, with good labor pains, hold out promise of success.

(*b*) and (*c*) If failure results, version and axis-traction are held in reserve. Interference by either of these methods should not be attempted unless there is every reason to expect a successful issue. Failure jeopardizes the chances of a subsequent abdominal section.

In deciding between version and high forceps, the choice should be guided by the experience of the individual operator—some preferring one, and some the other. Version is contraindicated in the justominor pelvis, as a rule. Some obstetricians perform version if the head be movable above the inlet, and the high forceps operation if engaged. Personally, I believe it is obsolete practice to perform version or the high forceps operation in any case when a test of labor pains fails to engage the head and the head cannot be forced through the brim of the pelvis with the patient under chloroform. This statement will be challenged by some obstetricians whose opinions are colored by the teachings of the Dublin and Edinburgh schools.

Wright, of Toronto, gives this advice in his text-book of *Obstetrics:* "If, at the end of one hour (of labor) the head shows no tendency to engage the brim, turn and treat as an ordinary pelvic presentation." Again, in minor degrees of contraction of the conjugate (4 to 3½ inches—10 to 8 cm.), "perform version as soon as possible, and treat as an ordinary breach case; or allow the head to mold through the brim, and let nature complete the delivery; or allow the head to mold two or three hours, and then use forceps."

The work of Milne Murray has advanced the claims of high forceps, and he is reported as having successfully delivered infants by this means, with the woman in the Walcher position, through a conjugate of 3¼ to 3½ inches (8 or 8.75 cm.).

Lapthorn Smith, of Montreal, says: "I am strongly in favor of high forceps rather than turning in minor degrees of pelvic contraction. I have delivered a living child with high forceps when labor had been going on furiously for twenty-four hours without the head having engaged at the superior strait."

Others are not enthusiastic supporters of either axis-traction or version in minor degrees of contraction.

Reuben Peterson[5] says: "I do not favor high forceps as a treatment of minor degrees of pelvic contraction. I think it is one of the most dangerous operations for both mother and child that we have in obstetrics. Versions are a little better, but not much."

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[5] Personal communication.

Joseph B. De Lee[6] says: "Regarding high forceps and version in contracted pelvis, I am using both less and less, as they are very serious operations for mother, and also for babe. I avoid them by inducing labor, and by Cesarean section."

E. G. Grandin[7] says: "Version would be my choice with head not engaged, cervix dilated or dilatable, membranes unruptured or just ruptured. High forceps, head not engaged, I never counsel."

E. Gustave Zinke:[8] "If, in a given case, I cannot deliver the patient with any degree of assurance of safety with the high forceps application or version, I prefer to do a Cesarean section."

Franklin S. Newell:[9] "Personally I prefer the abdominal route in all cases in a condition to go through the operation, where there is any reasonable doubt about the ability to abstract a living child through the pelvis, for I believe in proper hands the prognosis of Cesarean section, in proper cases at least, is no worse than that of version or high forceps. . . . The question of choice of operation between high forceps and version always appears to me in this way: that if a high forceps is attempted carefully, and fails, version can be subsequently performed; whereas, if version is performed as the primary operation, and fails, we have no operation left except a destructive one, for we have sacrificed the chances of the baby. So that personally I prefer a high forceps, or at least an attempted high forceps, in all cases of head presentation in which I have decided to deliver *per vias naturales,* rather than to perform a primary version. I recognize that it is a matter of personal equation, and I consider version a somewhat more dangerous, but also more efficient, operation than high forceps. I strongly believe, however, that we should extend our indications for Cesarean section to include the majority of cases in which high forceps or version may be rendered necessary by pelvic contractions."

Guided by these expressions of opinion, and by my own experience, I believe that in cases of labor in minor degrees of pelvic contraction one should "delay until labor has demonstrated the resources of nature," and then act as follows: After from two to six hours of labor, according to the severity of the pains, if the head has not engaged, perform Cesarean section, and not forceps or version. If the head has engaged, attempt a careful application of the axis traction with the woman in the Walcher position, and if the result does not give some assurance of success, perform Cesarean section. I believe version and axis-traction, with the head disengaged, are contraindicated by modern obstetric practice.

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[6] Personal communication.

[7] Personal communication. In 1890 Grandin published a paper in the Transactions of the American Gynecological Society, expressing advanced views advocating Cesarean section, which practically cover the ground taken in this paper.

[8] Personal communication.

[9] Personal communication.

(*d*) The indications for delivery by Cesarean section should cover cases of minor degrees of pelvic contraction when a few hours of labor pains demonstrate the inability of Nature to mold and engage the head. This indication should be extended to embrace those borderline cases in which the true conjugate is even as much or more than 8.5 cm. for the justominor, and 9 cm. for the simple contracted pelvis. Inability to force the head through the inlet under chloroform should be recognized as a justification for the operation, regardless of the degree of contraction.

Case XVIII of the series reported herewith illustrates this position. The woman entered the Columbian Hospital in the beginning of her fourth labor. The first labor was terminated successfully with a difficult high forceps operation. The infant was not as large as the subsequent ones, and survived with bad head injuries. The second and third labors were terminated in the same way, and both infants were delivered dead. The external pelvic measurements were unusually good: Interspinous, 25.0 cm.; intercrestal, 28.0 cm.; external conjugate, 20.5 cm.; and diagnonal conjugate, 10.5 cm. The woman had a simple contracted pelvis, with an estimated true conjugate of 9 cm. ($3\frac{3}{5}$ in.). Under chloroform, the head could not be made to pass the inlet. She was delivered by section and left the hospital in good condition at the end of three weeks. Her infant weighed $9\frac{3}{4}$ pounds and was vigorous and did well. At the woman's request to be made sterile her tubes were cut and the ends turned in between the folds of the broad ligaments.

High forceps extraction would have sacrificed the infant's life. and been as dangerous to the mother as the section. Labor might have been terminated by version with little risk to the mother, but much danger to the infant—a biparietal diameter of 9.75 cm., with a well ossified head, would have had to pass through a conjugate diameter of 9 cm. Symphysiotomy or pubiotomy would most likely have saved both mother and infant, but the tedious convalescence was a deterrent. Also, delivery by any of those methods—forceps, version, symphysiotomy, or pubiotomy—would have left the woman exposed to the risk of subsequent pregnancies and labors. Therefore, in this case, or any similar case, when the head remains above the brim after several hours of labor pains, and when it cannot be made to engage by strong suprapubic pressure under chloroform, modern obstetric surgery points to the advantage of Cesarean section.

Cases XIV, XV, XVI, and XVII were justominor pelves, and labor had continued from twelve to thirty hours without engagement of the head. Three were primiparæ, and Case XVI had previously given birth to a dead infant. A brief report of these cases is as follows:

Case XIV.—B. J., colored, aged seventeen years, occupation laundress, single, was admitted to Columbian Hospital May 23, 1907. Pelvic measurements gave a justominor pelvis with a true conjugate of 8.5 cm. (3⅖ in.). True labor pains began 8 A.M., May 24, and at 7.30 P.M. became quite strong. Examination under chloroform, head not engaged. Cervix dilated manually. At 11.30 membranes ruptured artificially; head tightly wedged in the brim. Forceps tried unsuccessfully. Cesarean section at 1.30 A.M., May 25. Baby delivered in three minutes; time of operation, thirty-two minutes. Patient developed considerable fever, which, on the fifth day reaching 104°, and dropped to normal on the ninth day. She sat up on the nineteenth day and went home on the twenty-fourth day. Mother and baby did well. Weight of baby at birth, 8¾ pounds.

Case XV.—D. T., colored, aged twenty-six years, housewife; admitted to hospital May 27, 1907, at 5.25 A.M., having been in labor for fourteen hours; pains very strong. Justominor pelvis; true conjugate, 7 cm. (2⅘ in.). The patient had been examined by a midwife four times without regard to asepsis, and lard was used as a lubricant for the fingers. Cesarean section performed at 1.30 P.M. Time of operation, thirty-three minutes. Highest temperature, 101.5°, on the second day; reached normal on the sixth day. Abdominal distention relieved by stomach tube. Discharged June 27, in good condition. Baby weighed 7 pounds 6 ounces; not strong at time of leaving hospital.

Case XVI.—K. L., colored, aged twenty years, married, housewife, was admitted April 18, with tertiary syphilis, condylomas on the right side of the vulva. Symptoms cleared up in two weeks by specific treatment. Justominor pelvis; true conjugate 9 cm. (3⅗ in.). Labor began 2 A.M., May 27, 1907. After twelve hours of labor the head had not engaged, and could not be forced into the pelvis by pressure under chloroform. Cesarean section performed at 3 P.M. Baby delivered in 2½ minutes; time of operation, 37 minutes. Recovered without complication; baby alive and weighed 5 pounds 14 ounces.

Case XVII.—M. T., colored, aged thirteen years, single, admitted in labor June 13, 1907, at 12.30 A.M. Justominor pelvis; true conjugate 6.5 cm. (2⅗ in.). Twelve hours' labor; Cesarean section. Baby delivered in 3½ minutes; time of operation, 37 minutes. Weight of baby, 7¼ pounds. Mother and infant left the hospital in good condition on the twenty-sixth day.

These four sections were performed within three weeks, and two of them on the same day.

(*c*) *The Indications for Symphysiotomy and Pubiotomy.* The objections to these methods of delivery are the tedious and painful after-treatment and retarded convalescence. A retention catheter will obviate the difficulty and pain of catheterization. The necessity of keeping the bones in apposition, the maintenance of the back position for two or three weeks, the difficulty of keeping the parts clean, of giving vaginal douches and proper attention to the evacuation of the bowels, are some of the serious drawbacks to either operation. The employment of a bedpan or douche pan is so painful that, for the first week, it renders life almost unbearable. Unless one is provided with a special bed, it is well to use a cot having a canvas cover, with a hole cut out beneath the buttocks, to permit these attentions without moving the patient.

Complications met with afterward are: tearing of the anterior vaginal wall, œdema or hematoma of the vulva, foul-smelling lochial discharge, fever, and septic phlebetis. The maternal mortality after symphysiotomy and pubiotomy is practically *nil* in the primary operations. Deaths occurring after the secondary operations are due to infection and complications resulting from ineffectual efforts at delivery by forceps before resorting to these operations. Pubiotomy seems to offer little, if any, advantages over symphysiotomy. In a study of this operation in America, I was able to collect 20 cases—12 primary, with no maternal death, and 8 secondary, with 4 deaths. On account of the serious objections stated, I believe it will seldom be performed as a primary operation. Symphysiotomy and pubiotomy will, however, remain useful expedients when one is forced to resort to one or the other in preference to craniotomy upon a living child. When the woman has been exhausted by prolonged labor, by manipulations, by the use of forceps, and when the parts are contused and lacerated, and she is probably infected, nothing else remains to be done.

The following case came under my care recently:

On returning to Washington, October 1, 1907, from a vacation, my attention was called by my associate, Dr. Edgar Snowden, to Mrs. B., a primipara, seven and a half months pregnant. Her husband was in the navy, and she had come from his station in Samoa to be confined. She had a justominor pelvis, and my investigation confirmed his measurements. They were as follows: Interspinous, 23 cm.; intercrestal, 24 cm.; external conjugate, 18 cm.; external obliques, right, 23 cm.; left, 22 cm.; diagonal conjugate, 11 cm.; estimated true conjugate, 9 cm. ($3\frac{3}{5}$ inches). Palpation: Large uterine tumor; normal quantity of amniotic fluid; large infant.

At the time of my examination she had reached the thirty-second week of gestation. The head could be made to engage within the brim at weekly examinations, made to the thirty-seventh week. Cesarean section was considered, but the case gave promise of successful delivery by induced labor. She entered my private hospital, and premature labor was induced after some delay. A bougie was inserted, removed, and replaced the following day. No pains having been excited, the lower segment was packed with gauze. Labor began November 4, 1907. The membranes ruptured spontaneously at 8 A.M.; os dilated at 2 P.M., head partially engaged with occiput posteriorly. At 4.30 forceps were employed without success. Patient was taken to the operating room and axis-traction employed with the patient in the Walcher position. The head was brought down into the cavity with a persistent occipitoposterior position. The head was large and well ossified. Effort at manual rectification failed, on account of the small pelvic space. The infant's heart-sounds were strong, and craniotomy was, therefore, considered to be contraindicated. The promising time for Cesarean section had passed, because of the eight hours of hard labor, the manipulations with bougies and gauze packing, the insertion of the hand in the effort to rotate the head, and finally the attempts to deliver by forceps. Symphysiotomy was then performed. The joint separated only 1 cm., which increased to 3 cm. during forceps extraction. The head was delivered with the occiput posterior. The perineum was lacerated in the second degree, and the anterior vaginal wall was torn from its pubic attachment. There was no hemorrhage. Lacerations were sewed up and the patient bandaged and put to bed. The highest temperature was reached on the third day—100.4°. There was marked œdema of the left labium major from the sixth to the tenth day. The perineal stitches of silkworm gut were removed on the thirteenth day, and perfect union resulted. The laceration of the anterior vaginal attachment healed satisfactorily. There was some odor to the lochia for eight days. Examination on the seventeenth day showed good union of the symphysis, except a V-shaped indentation at the lower border. The patient turned on her side, and no movement was felt at the joint. Slight motion was possible at the symphysis by grasping the iliac crests and rocking the pelvis. The infant weighed 9¾ pounds and was none the worse for the delivery, except an abrasion on the neck behind the right ear.

The large size of the infant and the persistent occipito-posterior position prevented a successful delivery with the forceps. In the event of a subsequent pregnancy, I should perform an elective Cesarean section and sterilize the patient. She left the hospital at the end of the fifth week, herself and baby in good condition. The joint union was firm and she walked well.

Another indication for selecting symphysiotomy or pubiotomy may also be recognized when facilities are not at hand for performing Cesarean section.

(*f*) *Craniotomy.* The indications recognized for performing craniotomy are after prolonged labor, or failure of version or forceps, and the infant is dead or dying. The diminution of the true conjugate must not be below the limits of an absolute indication for Cesarean section. If craniotomy be rejected on account of the chances of saving the child, symphysiotomy or pubiotomy must be performed if the woman is not in a condition for Cesarean section.

Tabular Report of Eighteen Cesarean Sections.

Case.	Date.	Color.	Diameters in centimeters.							Hours labor.	Previous labors.	Indication for operation.	Result to mother.	Result to infant.	Weight of infant.	Remarks.
			Inter-spinous.	Inter-cristal.	Right oblique.	Left oblique.	Conjugate externa.	Conjugate diagonal.	Conjugate vera.							
1	Feb. 9, 1890.	W	19.0	14.0			14.0		4.0	39	0	Absolute; dwarf; flat; generally contracted.	Recovered.	Lived.		Reported in Transactions of American Gynecological Society, 1890.
2	Aug. 1894.	W								0	0	Rachitic; flat; absolute.	Recovered.	Lived.		Elective operation; patient of Dr. W. S. Bowen. Operation at Garfield Hospital; records lost.
3	Mar. 13, 1903.	C	23.5	25.0			19.5			48	2 normal.	Normal pelvis; ventrofixation.	Recovered.	Lived.	6 lbs. 12 oz.	Dystocia due to ventrofixation.
4	Apr. 14, 1903.	C	23.0	23.0	19.0	18.0	16.0	9.0	7.0	20	0	Flat; generally contracted.	Recovered.	Died.	5 lbs. 13 oz.	Absolute indication; infant stillborn.
5	Oct. 13, 1903.	C								0	0	Elective; hip-joint disease; obliquely contracted pelvis.	Recovered.	Lived.	8 lbs.	Scoliosis; rachitic, flat pelvis; absolute indication; operation at Garfield Hospital; records lost.
6	Nov. 17, 1903.	C	24.0	28.0	22.0	22.0	17.0	8.0	6.5	12	0	Flat, rachitic pelvis; absolute.	Recovered.	Lived.	7 lbs. 4 oz.	Head not engaged; absolute indication.
7	Feb. 22, 1904.	W	23.5	26.5	19.5					0	2 normal.	Fibroid in pelvis.	Recovered.	Died.	3 lbs.	Normal pelvis; operation at seventh month of pregnancy; Porro.
8	June 2. 1904.	W								0	0	Normal pelvis; placenta prævia.	Recovered.	Died.		Primipara; placenta prævia centralis, 6½ months; cervix contracted; severe hemorrhage; baby lived few hours.
9	Dec. 4, 1904.	C	19.0	20.5	20.5	20.5	17.5	8.0	6.5	0	2 long and difficult; 2 dead.	Flat; generally contracted.	Recovered.	Lived.	7 lbs.	No record of length of labor; indications absolute.
10	Dec. 19, 1904.	W	24.0	27.0	.2.0	22.0	20.0			40	0	Funnel-shaped pelvis.	Died.	Lived.	9 lbs. 4 oz.	Forceps failed; head in cavity; outlet contracted; pelvic inlet normal.
11	Mar. 18, 1905.	W	25.0	22.0			18.0	9.5	8.0	18	0	Simple flat pelvis.	Recovered.	Lived.	4 lbs. 12 oz.	Head could not engage.
12	Dec. 6, 1905.	C	22.0	23.0	18.0	19.0	17.0	9.0	7.0	16	0	Justominor.	Recovered.	Lived.	7 lbs. 12 oz.	Head could not be made to engage by pressure under chloroform.
13	Jan. 18, 1906.	W	21.5	25.5	20.5	20.5	18.0	6.5	5.0	0	0	Dwarf; absolute; generally contracted flat pelvis.	Recovered.	Lived.	6 lbs. 4 oz.	Elective operation.
14	May 25, 1907.	C	23.5	25.0	19.5	19.0	16.5	10.0	8.5	17	0	Generally contracted flat pelvis.	Recovered.	Lived.	8 lbs. 12 oz.	Forceps attempted; head could not be pressed into inlet under chloroform.
15	May 27, 1907.	C	21.0	23.5	20.0	19.5	16.5	8.5	7.0	21	1 dead baby.	Justominor.	Recovered.	Lived.	7 lbs. 6 oz.	Head not engaged and could not be pressed into inlet under chloroform.
16	May 27, 1907.	C	21.0	23.5	18.5	19.5	17.0	11.0	9.0	12	0	Justominor; head not engaged.	Recovered.	Lived.	5 lbs. 14 oz.	Head could not be pressed into brim under chloroform.
17	June 13, 1907.	C	20.0	22.0	18.0	18.5	14.0	8.0	6.5	20	0	Justominor; head not engaged.	Recovered.	Lived.	7 lbs. 4 oz.	Head could not be made to engage under chloroform; absolute.
18	Oct. 13, 1907.	W	25.0	28.0			20.5	10.5	9.0	3	3 high forceps: 1 alive, 2 dead.	Simple contraction; head not engaged.	Recovered.	Lived.	9 lbs. 12 oz.	Previous labors were difficult; axis traction forceps, and with babies dead.

Of the 18 operations reported in tabular form, 10 were on colored women, and 8 on white women. The 18 sections were performed within a period of eighteen years. Two were done within the first thirteen years of that period, and 16 in the last five years. The larger number of operations in the latter period is accounted for by the fact that the relative indications for performing Cesarean section have gradually been broadened to embrace those cases which were formerly submitted to high forceps and version. The results have shown no increase of danger to the mother and they have recovered without sepsis and lacerations of the birth canal. In regard to the infants, we notice this difference: living babies are now carried away by the mothers, and not dead babies by the undertaker. Of the 18 infants, 16 were viable, and 15 lived. Three of the cases of pelvic deformity (IX, XV, XVIII) had previously given birth to 6 infants—1 alive and 5 dead. The dead babies had been delivered by difficult high forceps operations. High forceps extraction in these cases at the Columbian Hospital has produced 7 dead infants in the last 20 operations, with a fœtal mortality of nearly 33 per cent.

The only viable baby lost was in Case IV. It weighed 5 pounds 13 ounces. The other 2 dead infants were 1 (Case VII) at the seventh month, weighing 3 pounds, removed by Cesarean section for a fibroid blocking the pelvis; and 1 (Case VIII) removed at six and a half months of pregnancy for placenta prævia centralis.

Thirteen of the women were primiparæ; 5 had previously given birth to children. Three have already been mentioned; 2 had had 2 babies each normally, because there was no pelvic deformity. They were Cases III and VII, who were operated upon for the result of a previous ventrofixation and for fibroid in the pelvis.

The indications for Cesarean section were absolute in 8 cases.

Of the 15 cases of pelvic deformity, the following classification was made: Justominor and flat, generally contracted pelves, 9; rachitic flat pelves, 3; simple flat pelves, 2; funnel-shaped pelvis, 1.

The fatal maternal case was in a primipara with a funnel-shaped pelvis. She had been in labor thirty-six hours, and forceps had been applied four times. My preference was for symphysiotomy, but the family requested Cesarean section. The woman was the wife of a naval officer, and it was desired to make her sterile, as subsequent pregnancies might occur at some point removed from skilled assistance. Death occurred on the third day from acute dilatation of the stomach. The baby lived.

The symptoms appeared soon after the patient was removed from the operating table. The pulse increased to 130 and the temperature to 101° the same evening. The next morning the abdomen was distended. Insertion of a rectal tube and high enemas gave no result. On the second day the bowels moved freely from hypodermic injections of eserine salicylate. There was little vomiting; some gas escaped by eructation. Calomel was given in small repeated doses;

food and stimulants were retained. On the third day the distention increased, the pulse became more rapid and feeble, and death occurred. The autopsy revealed the peritoneum clean and free from infection and the uterine incision healed. The intestines were empty up to within a few inches of the stomach, where the duodenum was found kinked or twisted longitudinally upon itself. The stomach was enormously distended. The use of a stomach-tube and postural treatment would most likely have saved the patient. The true condition was not recognized at the time.

Case XV of the series tabulated presented postoperative symptoms of a similar character, but was promptly relieved by washing out the stomach.

THE CLINICAL AND PATHOLOGICAL ASPECTS OF RODENT ULCER.

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In 1827 Jacob,[1] of Dublin, was the first to describe rodent ulcer as a distinct clinical entity, as did Lebert[2] in 1851. In 1865 Thiersch described very fully as a form of superficial carcinoma of the face that which for many years had been spoken of as rodent ulcer on account of its clinical course. Since his time the lesion has been much written about, both from the clinical and the pathological aspects. The clinical history in all cases is very similar. Bland-Sutton, J. C. Warren, Kaufman, and others who have written upon the subject, describe the condition in about the same words. The description given by Bland-Sutton[3] is concise and comprehensive: "In its common form, a smooth, rounded knob of about the size of a split pea is noticed on the skin of the face, either on the nose, eyelids, orbital angles or cheek. This knob may remain for years (seven, eight, or even twelve), and cause no inconvenience save unsightliness; then, without obvious reasons, it may ulcerate and destroy the surrounding tissues, involving all tissues in its vicinity—skin, muscles, fat, cartilage, eyeball, and bone—and producing horrible destruction of the bone, in some cases even destroying the base of the skull and the meninges and exposing the brain. To produce such terrible effects the disease requires five, ten, or even more years. In its course it destroys everything, never cicatrizes, and is painless. Although rodent cancer arises mainly in the facial situations already mentioned, it may occur on the neck and the pinna; it has been met with on the trunk, but never, so far as I know, on the limbs. It occurs most frequently in advanced life, but is not uncommon between thirty and fifty. It has been recorded at the age of twenty, but never before puberty (fifteenth year). It is more frequent in men than in women." Warren,[4] in describing the physical appearance of the rodent ulcer, says: "When discovered in the early stage of development it is found that the new formation has broken down in the centre, and an ulcer has formed. The ulceration is not deep, the surface is quite flat, and is surrounded by a pearl-colored rim. Around the edge of the ulcer the skin appears in a healthy condition. The absence of inflammation in the diseased part is characteristic of cancer. There is no red and infiltrated skin, as seen around tuberculous or syphilitic ulcers. The pearl color of the rim is due to the presence of epithelial cells, and it is characteristic of this form of cancer. When there is extensive breaking down of the tissues and inflammatory complications, the presence here and there of fragments of this pearly rim, perhaps made visible by the use of a hand lens, will enable the surgeon to recognize the disease under its disguise."

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[1] Dublin Hosp. Reports, 1827.

[2] Traité pratique des maladies cancéreuses, Paris, 1851.

[3] Tumors, Innocent and Malignant, 1903.

Although there is no disagreement as to the clinical features of the disease, the pathology of the origin of the condition has been much discussed. Thiersch[5] claimed that the rodent ulcer developed from the sweat glands, because he found proliferation of the cells forming the walls of the ducts, and some authors described it as an adenoma of those glands. Besides Thiersch, the sweat gland theory was upheld by Thin,[6] who claimed that he could trace every intermediate stage from normal duct to tumor growth. Norman Walker[7] also made similar claims, basing his views upon the character of the cells. According to Bland-Sutton, the following sources have been described as the origin: (1) Sebaceous glands; (2) sweat glands; (3) the hair follicles; (4) the outer layer of the root sheath of a hair; (5) epithelial remnants in the course of the facial fissures; (6) vestiges of the tear-pits of ruminants; and occasionally a hairy mole.

The sources that come most prominently under discussion are the sebaceous glands, the sweat glands, and the basal layer of cells of the squamous epithelium at any point in their distribution. Bland-Sutton, as a result of his investigations, ascribes the origin to the sebaceous glands. Warren, speaking of the epithelium, describes the cells as small and delicate, and reminding one strongly of those seen in the rete mucosum near the borders of the papillæ, or in the sheath of the hair follicles.

Some authors have considered this form of growth to be not epithelial, but endothelial, in character. Braun[8] reported several cases, and advanced three reasons for considering these tumors to be other than carcinomas: (1) The cell formation; (2) the failure of connection of the tumor masses with the surface and its dependent structures (hair follicles, sweat and sebaceous glands); and (3) the lack of cornification. He says that "In the centre of the cell masses the individual elements are not infrequently arranged in concentric balls, without at any time undergoing cornification." Krompecher[9] investigated the three points above mentioned, and concluded that they were insufficient and that the growths belonged to the epithelial class. Borst[10] considers them to be endothelial, on the ground, especially, that they do not originate from the surface nor its appendages, but only secondarily grow into them.

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[4] Surgical Pathology and Therapeutics, 1900.

[5] Epithelkrebs, namentlich der Haut, Leipzig, 1865.

[6] Cancerous Affections of the Skin, London, 1886.

[7] Trans. Path. Soc. London, 1894, v. 45.

Krompecher[11] advances the opinion that the above form of skin cancer develops from the lowest layer of the surface epithelium, the basal cells. This idea has been combated by Borrman,[12] who believes that the origin of these growths is in embryonal rests, and not from the basal layer of the epithelium. For that reason he refers to them as corium carcinomas, using the term to designate their location but not their origin. Krompecher,[13] in a reply to Borrman, briefly reviews his former work, and insists that the origin of most of these ulcers is from the basal cells. He repeats, however, his statement that in some cases there may have been a development from an embryonal rest. L. Noon,[14] from the examination of several rodent ulcers, concludes that to his mind there is very convincing evidence of their origin from the Malpighian layer of the epidermis near the necks of the hair follicles and from the reflection of this layer, which forms the outer root sheath of the hair.

The consensus of opinion at present probably is that these growths have their origin in some portion of the basal layer of cells. Believing that a general study of this form of carcinoma might prove interesting, 16 cases of this condition, as admitted to the St. Louis Skin and Cancer Hospital, were taken as the basis for this article. The clinical features of the individual cases are given in the following histories: but the general gross appearances and the microscopic findings will be taken up collectively later.

No. 302, J. M. B., aged forty years, male, white; admitted April 19, 1906. Tumor began about five years ago as a small nodule on the side of the nose. It ulcerated, became covered by a scab, and gradually increased in size. At present the growth is nodular, edges, which are sharply defined, are slightly raised. Is quite hard to the touch, and is about 1 cm. in diameter.

No. 466, J. W., aged sixty-one years, male, white; admitted October 17, 1906. Family history negative. Present trouble began about one year ago as a pimple behind the right ear. Various ointments and liniments were applied without any effect. The ulcer would frequently heal over, forming a scab, which, on removal, would cause bleeding. At present there is situated behind the right ear a small irregular, scab-covered ulcer, about 1.5 cm. long and 0.5 cm. wide. Is quite superficial, and has indurated edges.

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[8] Archiv f. klin. Chir., 1892, v, 43.

[9] Ziegler's Beiträge, v, 28.

[10] Geschwulstlehre, 1902.

[11] Der Basalzellenkrebs, 1904.

[12] Zeitschr. f. Krebsforsch, 1904, v, 2.

[13] Zeitschr. f. Krebsforsch, 1905, v, 3.

[14] Jour. Path. and Bact., Cambridge, October, 1907.

No. 358, J. L. T., aged seventy-three years, male, white, service of Dr. F. J. Lutz; admitted July 11, 1906. Two sisters died of cancer of the breast. In 1889, eighteen years ago, a barber shaved off a mole situated on the left side of his chin. This remained an open sore, gradually increasing in size, until a year ago, when a scab formed over it. This was picked off, and since then the condition has gradually become worse. At present there is on the left side of the neck just below the jaw a sulcus about 4 cm. long, 1 cm. wide, and 0.5 cm. deep. This is covered with granulations, and the skin for a slight distance on both sides is somewhat infiltrated.

No. 364, J. S., aged forty-six years, male, white, service of Dr. H. G. Mudd; admitted July 26, 1907. About five years ago, without any apparent cause, an ulcer developed on the left cheek below the eye. At present it is a little over 1 cm. in diameter, and is covered by a scab.

No. 293, Mrs. W., aged thirty years, female, white, service of Dr. F. J. Lutz; admitted June 2, 1906. The growth was first noticed about four years ago. At present on the right side of the neck, below the mastoid process, there is a slightly depressed oval area about 1 cm. in length. The edges are slightly raised and indurated, but there is no ulceration.

No. 152, M. M., aged seventy years, female, white, service of Dr. N. B. Carson; admitted February 13, 1906. Present trouble began about five or six years ago, when the lower right eyelid became irritated by wild hairs. Patient said that the eyelid had been sore for three years, but that she did not notice any growth until three or four months ago. Examination shows the presence of an ulcerating growth, that has entirely destroyed the lower right eyelid. It extends from the inner canthus to the outer, then passes up around the external angle, and has destroyed about one-third of the upper lid. The lower conjunctival sac is also involved. The floor of the ulcer is covered by red granulations, from which there is a thin but somewhat purulent discharge. The edges of the ulcer are raised and indurated. The skin beyond the growth is not infiltrated to any extent (Fig. 1).

No. 39, Mrs. M., aged sixty-five years, female, white, service of Dr. F. J. Lutz; admitted November 15, 1905. The lesion was first observed seven years ago in the form of a wart at the inner canthus of the right eye. Since then it has gradually increased in size, until the lower lid and the orbital structures have become involved.

No. 110, J. E., aged fifty-four years, female, white, service of Dr. H. G. Mudd; admitted January 22, 1906. Present trouble began about twenty years ago, when she noticed a mole on her temple. This was constantly irritated by combing her hair, at which time it would bleed and then scab over. She frequently pulled off this scab, and the mole finally developed into an open sore. This slowly increased in size, and by last year the ear was destroyed. Examination shows a very large ulcerating area about 9 or 10 cm. in diameter. The floor of the ulcer is covered by red, raised, spongy looking granulations. The edges are raised, indurated, and somewhat nodular. The external ear is entirely gone, with the exception of a small piece about 2 mm. long and 1 mm. wide, that hangs down and is attached by healthy skin. The external meatus consists of a large cavity lined by granulations. At the lower edge of the ulcer there is a distinct scar formation that would indicate a tendency toward healing. Some lymph nodes in the anterior chain near the angle of the jaw are palpable.

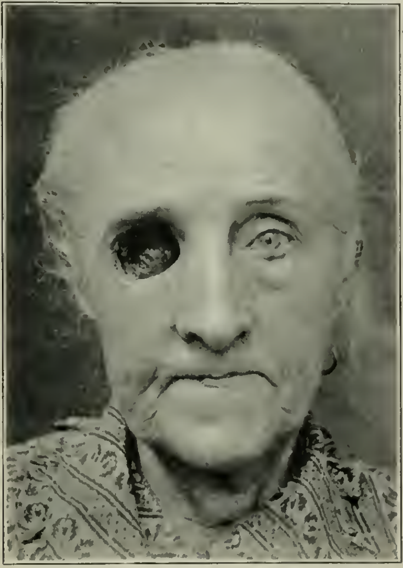

FIG. 1.—Rodent ulcer of the right ocular region (No. 152, M.M.).

No. 229, F. J., aged fifty two years, male, white, service of Dr. N. B. Carson; admitted April 19, 1906. About three years ago the patient noticed a small area back of the left ear that would become slightly elevated, and where a scab would form, which would later come off. This became worse about one year ago, and since then has gradually increased in size. Examination shows the presence behind the left ear of an ulcerated area about 4 cm. long, of varying diameter, and about 2 cm. deep. It involves the skin over the mastoid, the concha of the ear, and the external meatus. The edges are raised and indurated, but the surrounding skin is not infiltrated. The floor of the ulcer is covered by red granulations that bleed easily (Fig. 2).

No. 715, E. C., aged thirty-three years, female, white, service of Dr. N. B. Carson; admitted April 23, 1907. About ten years ago there was noticed a small node at the root of the nose. Caustics were applied without any beneficial effect. The ulcer gradually increased in size, until at present it is about 1 cm. in diameter, irregular in shape, and extends deep into the tissues.

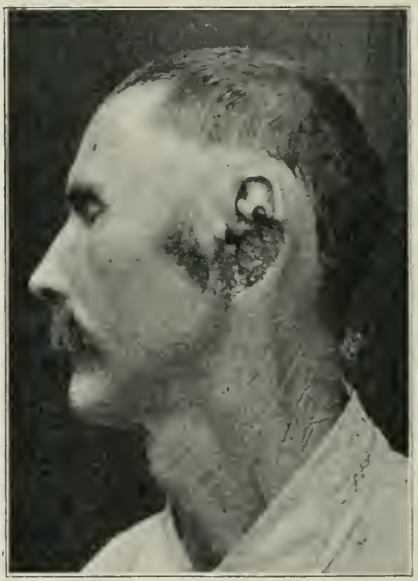

FIG. 2.—Rodent ulcer of the right auricular region, showing irregular but sharply defined edges (No. 229, F. J.).

No. 935, T. T., aged forty years, male, white, service of Dr. F. J. Lutz; admitted January 29, 1907. Some five years ago there appeared a small sore on the right side of the nose. This gradually increased in size, and three years ago the patient was operated upon, but the surgeon did not excise the entire growth, and the condition was simply aggravated. At present the ulcer has extended until it has destroyed the right side of the face. The right eye has been eaten away, as has been the right cheek, superior maxilla, and soft palate. The posterior nares, the remaining half of the hard palate, the pharynx, and the lower teeth are entirely exposed. Speech is almost impossible. During the four months the patient was in the hospital the ulcer steadily advanced, until death from exhaustion occurred on July 6, 1907 (Fig. 3).

No. 419, W. W., aged seventy-four years, mal , white, service of Dr. F. J. Lutz; admitted September 21, 1906. The present trouble began about fifteen years ago, when a pimple appeared on the left cheek near the angle of the mouth. This was cauterized, and remained apparently well for six years, when it returned. It was again treated, seemed cured, but again appeared in six years. Since then it has been treated spasmodically, but has gradually increased in size. Examination shows a superficial ulcer extending from the left corner of the mouth over the cheek for a distance of about 5 cm. The edges are irregular and brownish-red in color.

No. 907, Mr. T., aged seventy-five years, service of Dr. H. G. Mudd; admitted September 4, 1907. About three years ago there appeared what the patient thought to be a small mole situated below the eye, near the nose. About three months ago this began to ulcerate slightly. At present the ulcer is about 1 cm. in diameter, the edges are somewhat elevated and everted, and are of a pearl color. Does not bleed easily.

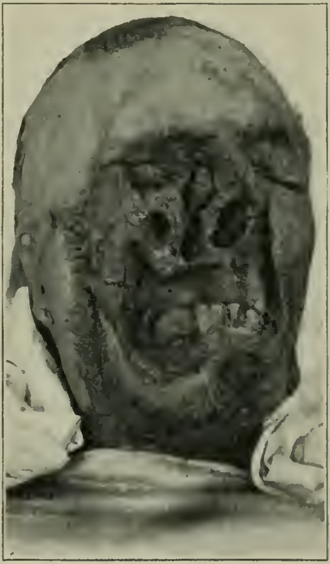

FIG. 3.—Showing degree to which the destruction of tissues can progress (No. 935, T. T.).

No. 332, J. P. C., aged fifty-nine years, male, white, service of Dr. N. B. Carson; admitted June 26, 1906. In 1889, seven years ago, a barber cut off a mole situated on the right cheek over the malar bone. This place healed over, but later on was again cut off by a barber. After this it never completely healed. Was treated with caustics without effect. Examination shows an irregular ulcer with indurated edges, about 2 cm. in diameter, over the right malar bone. This is adherent to the deeper tissues, and the skin in the neighborhood of the ulcer is also adherent (Fig. 4).

The gross appearance of the ulcers in the foregoing cases is practically alike in all instances. The edges of the ulcer are slightly raised, indurated, nodular, and of a grayish color. There is, as a rule, no surrounding zone of infiltration or inflammation. The floor is covered with granulation tissue, and in one instance only, No. 110, is there any attempt toward scar formation and healing. Bland-Sutton states that the rodent ulcer "never cicatrizes," but in this case it had done so to a well-marked extent. Ulceration usually occurs comparatively early in the course of the disease, but in Case No. 293 the surface epithelium, although very much thinned in places, was still intact after four years. The microscopic structure is also so similar that a single description will practically suffice for all the cases. In thirteen of the specimens the formation of the cell nests is quite characteristic. Instead of the nests having regular margins, it is found that the usual arrangement is a markedly irregular papillary outline. These projections may be long, narrow, and pointed, or, as is more commonly the case, short, blunt, and finger-like, giving a peculiar rosette appearance to the nest.

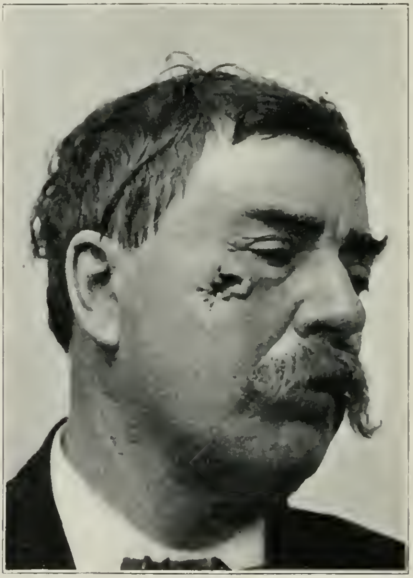

Fig. 4.—Rodent ulcer showing elevated and indurated edges, and nodules pearly gray in color (No. 332, J. P. C.).

The majority of the tumor cells contain rather long, narrow, spindle-shaped nuclei that, as a rule, stain quite deeply, although others are more vesicular, and stain less markedly. The cells seen in the central portion of the nests show no definite arrangement, other than finding here and there many of them lying in parallel rows. Those cells, however, at the periphery of the larger nests show a distinct tendency to be arranged in a columnar fashion with the nuclei at right angles to the surrounding tissues. This was quite marked in 13 of the 16 cases examined and existed to a slight degree in the other 3.

In 9 specimens there was observed a quite well-marked network formation of the columns of cell nests. These interlaced and surrounded areas consisting of an almost transparent, finely reticulated tissue. No definite structures could be found in these areas, no cells or connective tissue fibers. The impression obtained is, however, that they may be remnants of sebaceous glands that have undergone degeneration. As all the specimens had been passed through alcohol and ether, no attempts were made to stain for fat granules.

In 2 instances there were areas of connective tissue enclosed in a network formation, while in the remaining 5 there was no such arrangement. In 4 of the cases there was found a very slight concentric arrangement of the cells, but in none was there any keratin or true pearl formation. Krompecher says that cornification is not so unusual, but Borrman in 80 cases saw it twice only and then very slightly. Mitotic figures proved to be quite numerous in 11 instances, although the durations of the growths varied from one year to twenty-four. In the other 5 specimens the mitotic figures were few. In 10 cases in which the surface epithelium was present it was considerably thinned over the growth, and the papillæ were either absent or much compressed and pushed aside. One specimen gave the appearance of the growth being in direct continuity with the surface epithelium. The distribution of the sebaceous glands was of interest. There were only 3 specimens in which even slight traces of the glands could be discerned in the area of the growth, although in 10 there were numerous sebaceous glands in the adjacent tissue. In No. 364 there was one area in which the strands of the tumor cells were found more than one-half surrounding a portion of a sebaceous gland. In 5 specimens these glands were not present. Sweat glands were present in most of the specimens in the tissues adjoining the growth. Round-cell infiltration was present in all the specimens, particularly along the advancing border of the growth, although it was found in varying degree in the central areas.

In a previous paper [15] I reported the findings concerning the elastic tissue in rodent ulcers from a study of 13 cases. It was found that in all of them there was marked fragmentation of the elastic tissue away from the growth as well as in it. The amount of the elastic fibers decreased greatly the farther away from the periphery, and in one specimen there were almost no fibers, notwithstanding the fact that there was an unusual amount of connective tissue surrounding the cell nests. In another specimen taken from deep in the tumor there was no elastic tissue present, not even in the small fibrous areas containing the capillary bloodvessels. A third slide showed an unusual amount of elastic tissue in the skin and surrounding the cell nests, but even in this one there was less elastin in the central portion of the growth. Five out of the 13 specimens also showed distinct evidences of the mechanical crowding together of the elastic fibers. In 6 of the 13 cases the duration of the condition was ascertained. The most recent was of three years' standing, the oldest twenty-four. No definite relationship between the duration and the amount of elastic tissue could be shown. In the three-year case there was more elastin than in any of the others, while in the one of fourteen years there was a large amount of connective tissue, but only a very few small fragments of elastin.

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[15] Jour. Med. Research, 1907, xvi, 7.

In taking up the clinical features of the above cases there is one point of particular interest, that is, the absence of infiltration of the lymph nodes. The rapidity of the growth or the degree of involvement seem to have no bearing. In only one case, No. 110, was any enlargement of the lymph nodes found. None of them were obtained for microscopic examination, so it is not possible to determine definitely whether or not the enlargement was due to malignant infiltration. As there was a very extensive ulceration in this case, it seems quite probable that the increase in size was the result of secondary infections. In No. 935, upon whom an autopsy was done, no infiltrated nodes were found, nor were there any metastases to distinct structures. This fact is one that would make it seem probable that early operation in the form of excision would often result in a permanent cure.

A number of the above cases were treated by the x-rays for varying periods, but there did not seem to be any permanently beneficial results. For a while the lesion would seem to improve, the skin close in to a slight extent, and the discharge become less. After a few weeks or so the patient would stop coming to the hospital and disappear for some months. The lesion would again break down and the patient once more return for treatment. Excision followed by the x-rays gave the best results.

The family history is of interest in only one case, No. 358, in which two sisters died of cancer of the breast.

The duration of the condition at the time of admission to the hospital varied from one year to twenty-four. The average period in the 14 cases in which the process had been watched from the beginning was a fraction over eight years for the two sexes—ten years in women, and a little less than seven in men.

If the age at which there was first noticed any trouble is taken, we find the following conditions: twenty to twenty-nine years, 2 cases; thirty to thirty-nine years, 3 cases; forty to forty-nine years, 2 cases; fifty to fifty-nine years, 5 cases; and sixty to sixty-nine years, 2 cases. This would indicate that the decade most prone to attack is that between fifty and fifty-nine years, although it is found to occur at much earlier periods. The youngest case was in a woman of twenty-three, and the oldest in a woman of sixty-five. The average age at which the growth began in 5 cases in women was forty years. In men, the earliest age at which a rodent ulcer began was thirty-five, the oldest was sixty, the average age in 9 cases being forty-nine.

The percentage as regards men and women in these 16 cases showed 62.5 per cent. in men, and 37.5 per cent. in women, which is just about the reverse of the figures when cancer generally is taken into consideration.

As far as location is concerned, 8 of the 16 cases began in the region of the eyes and the nose, particularly near the inner canthus, while of the others 3 appeared behind the ears or upon the neck, with the remaining 5 scattered over the face.

All of the 16 cases occurred in whites, none having been seen in the colored race.

The following table gives a summary of the 16 cases:

No.	Location.	Duration.	Age on Admission.	Sex.	Race.	Age when Growth Began.
302.	Side of face	5 years	40	M.	W.	35
466.	Behind right ear	1 "	61	M.	W.	60
358.	Left chin	18 "	73	M.	W.	55
364.	Left cheek	5 "	51	M.	W.	46
293.	Right side neck	4 "	30	F.	W.	26
152.	Right lower lid	5 "	70	F.	W.	65
39.	Inner canthus	7 "	65	F.	W.	58
110.	Temple	24 "	54	F.	W.	30
490.	Below left eye	....	55	F.	W.	..
14.	Inner canthus	....	52	M.	W.	..
229.	Behind ear	3 "	52	M.	W.	49
419.	Angle of mouth	15–20 "	74	M.	W.	55–60
907.	Inner canthus	3 "	59	M.	W.	56
715.	Root of nose	10 "	33	F.	W.	23
935.	Side of nose	5 "	40	M.	W.	35
332.	Cheek	7 "	59	M.	W.	52

ERYSIPELOID OF ROSENBACH.

A NOTE ON ITS OCCURRENCE IN LABORATORY WORKERS.

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My object in making this report is to place on record two cases of the interesting and somewhat unusual affection, known as erysipeloid of Rosenbach, which were contracted in an unusual manner, as well as to make mention of a third case, which, while not seen personally, had symptoms, as related to me, that were strongly suggestive of the disease. These three cases were all in scientific investigators or their assistants, engaged in studies in comparative and experimental pathology.

Case I.—E. G., a physician, in excellent health, pricked the ring-finger of the left hand, or infected a previously existing abrasion in that locality, while working with a mass of semiputrid pigs' snouts, from which he was making chrondrosulphuric acid to be used in the experimental production of amyloid disease. Within thirty-six hours he developed what appeared to a cellulitis of the end of the finger; and on the following day, December 9, consulted me. The appearance was that of an ordinary paronychial affection. It was incised, but no pus was found. The swelling and tension were relieved, and in a few days it was apparently well.

He returned to his previous work, protecting the finger in a measure by a finger-cot. Within twenty-four hours, December 14, he noticed a swelling of the finger near the end. This swelling was tense, dark red, and limited by a well-defined margin, without vesiculation or pustulation, and differed entirely from an ordinary cellulitis in appearance. I at once was able to make a diagnosis of erysipeloid. An ichthyol-ointment dressing was applied.

The infection spread slowly toward the base of the finger, accompanied with itching and burning, but without constitutional disturbance. Iodine was now applied around the infected area and beyond, but without effect in checking its spread. On the 19th it was noticed that it had spread to the palm of the hand. Lead-water and laudanum dressings were used. Three or four days later the swollen and red area began to fade.

The whole course of the infection was about fourteen days from the time of the first symptoms of cellulitis. It is possible that there were two infections of different nature, the erysipeloid being secondary to the primary cellulitis.

Case II.—Miss P., an assistant in the Laboratory of Comparative Pathology at the Zoölogical Gardens, and a young adult in good health, on October 28, 1907, while performing an autopsy on a cassowary that had died of acute enteritis, injured herself with a pair of scissors on the palmer surface of the left index finger while opening the intestine, but did not draw blood. Shortly afterward she washed the wound with carbolic acid and went on working. Later, she washed it with soap and water, lysol, and alcohol.

On the following day without protecting the abrasion, she made an autopsy on a Dorcas goat that had died of tuberculosis. On the evening of the same day she noted a swelling with inflammation at the site of the wound. There was no special pain. The inflammation travelled toward the base of the finger. The finger became red and swollen, and the seat of burning pain. She applied a poultice, and the inflammation receded toward the tip of the finger. On the

31st it returned to the middle phalanx. She continued the poultices for three days, when the dressing was changed to hot carbolic solution, 1 to 100. Later, hot bichloride lotion was used.

When I saw her, on November 5, 1907, the finger was swollen and slightly reddened. There were signs of an old abrasion over the second joint. The swelling was most marked at the proximal phalanx. The skin had been somewhat bleached by the hot, moist dressings. There was slight tenderness, but only a little pain; slight œdema, but no fluctuation. The temperature was 99.4°. There had been headache and slight feverishness the previous evening. A diagnosis of erysipeloid was made, and lead-water and laudanum was applied.

Two days later the swelling and redness were around the base of the finger, and had spread in the characteristic manner to the palm, with the usual well-defined margin marking the progress. There was a small blister on the dorsum of the finger, near the base—probably due to the applications used. An ichthyol dressing was applied. Cultures were made from the fluid in the blister by Dr. Herbert Fox, on glycerin-blood agar, saccharose agar, and glucose agar. The cultures failed to show a growth.

November 9, two days after this, the inflamed area had faded. There was no more pain. Burning and itching had been the most prominent symptoms. Three days later, November 12, it was noted that the inflammation had gone back to the end of the finger, which was red and swollen, with some throbbing, itching, and burning. After this the condition quickly subsided; and three days later she was practically well.

Case III.—Dr. H. F., a young adult in good health, detailed to me, in a personal communication, the following history:

On the day before infection developed he had made a postmortem on a bird whose species he could not recall. He did not remember having had any break in the continuity of the skin. Infection began in the first phalanx of the thumb, which in eighteen hours became swollen, red, and tender, as well as somewhat stiff. Twenty-four hours later the inflammation had spread to the thenar eminence, which was swollen and painful, and also itched and burned. The first region affected was less painful. The following day the inflammation returned to the starting point, travelling thence to the distal phalanx. On about the tenth day the proximal phalanx again became swollen and inflamed. It was incised, but no pus was found on deep incision. There was, however, said to have been a small necrotic area. The wound was not packed. A wet dressing was applied, and it healed in about a week. The temperature was not taken at any time, but he thought that he had slight fever.

Erysipeloid of Rosenbach (also known as erythema migrans, erythema serpens, reticular lymphangitis, and crab cellulitis) was first clearly described by Morrant Baker in 1873, under the name of erythema serpens. Tilbury Fox, three years before, had placed on record two cases of what were perhaps examples of this disease; although the infection was derived not from animal matter, but from kid shoes in one case, and from clothing in another.

Erythema serpens, as described by Baker, was an infection of the hands that he observed in the butchers of the Smithfield meat markets. His description of the manner of infection, the general appearance, the tendency to spread, the self-limited course, and the absence of severe constitutional symptoms correspond closely to what we now recognize as erysipeloid. There were some minor differences, such as the exact color of the lesion, the shape of its margin, etc. Rosenbach[1] described the condition, gave to it the name that it now commonly bears, erysipeloid; pointed out the manner of infection, the common infecting agents, and the classes of persons exposed; described its clinical symptoms and course; and made certain bacteriological studies. Following him, Elliott, Cordua, Felsenthal, and Delbanco reported cases or made studies in the etiology. Finally, Gilchrist published a very large series of cases, with clinical, pathological, and bacteriological observations.

Briefly, erysipeloid is an erythematous inflammation, somewhat resembling erysipelas, observed usually on the hands of persons engaged in handling animal products that are liable to putrefaction and decay, especially, fish, shell-fish, meats, poultry, and cheese. Hence it is commonly encountered in dealers in fish, game, and poultry, butchers, and cooks.

A large number of the reported cases (323 of the 329 reported by Gilchrist) are due to crab-bites, or to lesions produced by handling crabs. This type differs slightly, if at all, from that resulting from infection from dead animal matter. The explanation that has occurred to me is that the crab, as is well known, is a feeder on decomposing animal matter. As crabs are handled in the market, they are likely to be contaminated by such matter; and, as the crab does its biting with its hands, as it were, with which it also handles its food, organisms may readily be conveyed thereby. It is not necessary to suppose, as does Gilchrist, the presence of any special ferment in the crab.

The only reported cases in which infection had been contracted in a manner similar to that in the cases herewith reported are those mentioned by Shepperd.[2] He stated that he had seen several cases in medical students, contracted from scratches in the postmortem or dissecting room. At least, this is the only reference that I have found to inoculation in members of our profession.

Cases of this disease are of comparative infrequency; or, at least, in the ordinary experience of dermatologists. Only four cases were observed in one year in Unna's entire clinic. The remarkable experience of Gilchrist and his associates at Johns Hopkins Hospital, whereby he was able to report 329 cases, is explained by the fact that 323 of those were lesions contracted in the handling of crabs. The prominence of Baltimore as a crab-handling community need only be mentioned as a rational explanation. The dermatologists with whom I have conversed have seen a very limited number of cases.

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[1] Mikroörganismen beidem Wund-Infektionskrankheiten. Arch. f. klin. Chir., 1887.

[2] Discussion on Gilchrist's paper before the American Dermatological Association in June, 1904.

That they are not more frequently reported admits of two explanations: one, that they are comparatively rare; the other, that they are frequently overlooked. My attention was first directed to this disease some years ago, while working in the surgical dispensary of the Episcopal Hospital, where I saw a small series of cases, mostly in handlers of fish and shell-fish. It is probable that in surgical dispensaries, at least, they are usually looked upon as variations of ordinary cellulitis. At the same time, it must be admitted that they are comparatively rare.

The infection takes place through a break in the continuity of the skin. Several points of inoculation are occasionally observed. The incubation period, according to Gilchrist's observations, averages two days. It may develop after a few hours, however, and rarely is delayed for several days or a week. It appears as a swelling with elevated, sharply defined edges, which soon affects the entire circumference of the finger; and is commonly described as of a dark-red color, with purplish, or even livid, edges. The finger is tense and only moderately painful, but itching and burning are prominent symptoms. Sections of tissue excised show an inflammation of the entire corium and, to a slight extent, of the subcutaneous tissue, with infiltration of polynuclear leukocytes and small lymph cells; œdema of the epithelial cells of the epiderm; and inflammatory changes, especially marked around the sweat-glands and blood-vessels (Gilchrist). It has a characteristic tendency to spread from its usual point of origin, near the end of the finger, toward the palm, the primarily affected area fading from red to yellow, and thence to normal. Reaching the palm, it may spread over it; but commonly, it soon affects the neighboring finger; and, when untreated, it may gradually spread to all the fingers and to the back of the hand. There is no fever, or other constitutional disturbance, and the lymph glands are almost never involved. It is more or less self-limited, commonly lasting from ten days to three weeks; and during this time there is a well-marked tendency to relapse. There is no suppuration, pustulation, or vesiculation; and no scaling follows.

Rosenbach obtained an organism that grew on gelatin at a low temperature. In its early stages it resembled a staphylococcus, being somewhat larger and in the shape of irregularly rounded and long bodies, which were the first stages of a thread-producing microorganism. This later developed as numerous tangled threads of irregular length, very slender, arranged now irregularly, and again in spirals, and forming a thick, tangled mass. It resembled a cladothrix. Inoculations of this organism in the human subject produced, according to Rosenbach, a typical lesion at the end of forty-eight hours.

Following Rosenbach, Cordua and Felsenthal confirmed Rosenbach's theories as to causation by a specific germ, a cladothrix; while Delbanco, working in Unna's clinic, failed absolutely to obtain the organism. Gilchrist reports the results of investigations by Finney, Wright, Abbott, Livingood, and himself. Their results, in a series of most carefully conducted histological and bacteriological studies, were absolutely negative. While credence is given to Rosenbach's views regarding the causation of erysipeloid in some text-books, it is evident that his experiments were conducted so long ago and that his results have so frequently failed of confirmation that one may be pardoned for looking askance at them. That erysipeloid is due to a specific infection is strongly indicated. The manner of infection, the pathological findings, and the clinical course are scarcely explainable on other grounds. But it certainly cannot yet be said that the specific germ has been demonstrated.

Erysipeloid is commonly said to require differential diagnosis from erysipelas, ringworm, and eczema; but a consideration of its local nature, the manner of infection, the clinical appearance, and the self-limited course will usually suffice to separate it from cases of the other affections mentioned. In a few instances it may be difficult to distinguish erysipeloid at its onset from an ordinary cellulitis due to pyogenic infection. In such a contingency, observation for two days will usually enable one to draw a distinction.

A number of methods of treatment have been tried. Gilchrist claims the best results from the use of Unna's salicylic-acid plaster in 25 per cent. strength, applied over and beyond the infected area, and covered with ordinary adhesive strips. In other cases, pressure with adhesive plaster alone sufficed to cure. The injection of carbolic acid, 1 to 20 to 1 to 30, around the edge, soaking in bichloride solution, applications of tincture of iodine, ichthyol ointment, and lead-water and laudanum, have all been used. I have thought that tincture of iodine, painted around and beyond the advancing margin, had sometimes an influence in checking the spread of the condition. I have found lead-water and laudanum, and ichthyol comfortable and soothing dressings. Gilchrist's results with salicylic plaster exceed any that I have obtained by other means.

THE SYMPTOM COMPLEX OF TRANSVERSE LESION OF THE SPINAL CORD AND ITS RELATION TO STRUCTURAL CHANGES THEREIN.

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(From the Department of Neurology and the Laboratory of Neuropathology of the University of Pennsylvania.)

Elsewhere[1] I have discussed the pros and cons concerning laminectomy in cases of fracture-dislocation of the spinal column. In studying the literature on this subject one is struck with the absolute impossibility of being able to determine definitely in many cases, within any reasonable time, whether the spinal cord has been irrevocably destroyed as a conductor of afferent and efferent impulses. Many investigators, chiefly surgeons, hold up the fact that a patient with a fracture-dislocation showing symptoms of complete transverse lesion occasionally will recover in the course of time, regaining a fair amount of power and usefulness in the lower limbs. Upon such a history they base their arguments as to the possibility of regeneration in the spinal cord when it is badly crushed. The next step in such logic is, that if such a patient can occasionally get well without laminectomy how many who die without this surgical procedure would have lived had their spinal canal been opened, clots and spicules of bone removed, and the cord given a chance to bridge with functionating nervous tissue the area of traumatic softening.

Now, let us keep before us this important fact: The neurons of the central nervous system, when acted upon by toxic agents or physically injured by factors either from without (concussion, fracture-dislocation, etc.) or from within (pressure of tumors, exudates, etc.), although structurally damaged, yet are able to exhibit, up to a certain point, an autorestoration, provided the factor or factors causing this condition have been removed or ameliorated.

Literature is not wanting in cases presenting symptoms of grave transverse involvement of the spinal cord the histological examination of which discloses little and insignificant structural changes. Gordon Holmes[2] reports 3 such cases which were the result of the collapse of tuberculous vertebræ with consequent pressure on the spinal cord. A fourth case in the same contribution was one of glioma of the pons. The paraplegia and sensory disturbance were so ex-

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[1] Injuries of the Spinal Cord, Jour. Amer. Med. Assoc., March 21, 1908.

[2] On the Relation between Loss of Function and Structural Change in Focal Lesions of the Central Nervous System, with Special Reference to Secondary Degeneration. Brain, 1906, iv, 514.

treme in the tuberculous cases that one would have been warranted in expecting to find a practically complete destruction of the spinal cord at the level of the bone lesion, with pronounced secondary ascending and descending degeneration. In 2 of the cases the paraplegia was present for about one year before death, in 1 case for five months. The microscopic examination of the segments involved revealed but a very moderate change, and above and below the site of the lesion there was no secondary tract degeneration found by the Weigert or the Marchi method. The fourth case presented at first a right hemiplegia, and with the further growth of the neoplasm a complete paralysis in all four extremities obtained for one month before death. Here, again, the histological examination failed to discover any secondary degeneration.

Holmes argues that the loss of the medullary sheath at a given point is liable to render the axis cylinder non-conducting, but does not necessarily entail the secondary degeneration above or below, as the case may be. Therefore, in such a case one might examine Weigert or Marchi preparations functionally distal to the lesion, and find a normal or almost normal condition of affairs, whereas in reality the tract at the point of injury would be minus the myelin sheaths and not a conductor of impulses. He cites the findings in disseminated sclerosis to support this view. In this disease there is a loss of myelin for a short distance only, with preservation of the axis cylinders, and yet a total break in the conducting ability of the fibers. In other words, he infers that the myelin is necessary to conduction, that its removal does not affect the anatomical integrity of the axis cylinders or its perikaryon. From these premises he draws the conclusion that reparative process would be possible.

This reasoning of Holmes is all that could be desired, until he comes to drawing the parallel between the non-conductivity of bare axis cylinders and disseminated sclerosis. In disseminated sclerosis, although a tract of axis cylinders bereft of their medullary sheaths remains to the end without medullary covering, the symptoms due to non-conduction of impulses in this area of the cord frequently pass away and there is every evidence that the nerve fibers in this area are functionating normally or almost so.

Schlagenhaufer[3] reports a case in which an endothelioma of the dura mater situated at the edge of the foramen magnum pressed upon and grossly distorted the upper cervical segments of the spinal cord and the medulla oblongata. The duration of this growth was one year and four months, and before death the patient presented a complete paralysis of all four extremities, as well as of the bladder and rectum. Complete anesthesia of the four extremities and the trunk was also present. Although there was pronounced change in

[3] Ein intradurales Endotheliom im Bereiche der obersten Halssegmente, Arbeiten aus dem Neurologischen Institut, a. d. Weiner Universität, 1902, viii, 88.

the second and third cervical segments (alle Stadien einer Compressionsmyelitis), yet secondary degeneration was conspicuous on account of its absence.

Bielschowsky,[4] in a painstaking investigation of axis cylinders when involved in tumor formation or in compression of the spinal cord, also thinks that they have the power to regenerate. His conclusions are interesting when compared with those of Ballance and Stewart[5] who were the sponsors in large measure for the neurilemma-nuclei theory of axis-cylinder regeneration. Bielschowski found in the outer zone of infiltrating tumors of the central nervous system, as well as in the compressed level of the spinal cord, naked axis cylinders which had been interrupted in their course by the pathological process, but were still in unbroken communication with their perikaryons. At the ends of these axis cylinders there were fine fibril-like prolongations ending in a peculiar oval-shaped structure not unlike the terminal organ of Held. On account of their oval shape and light centres he speaks of them as *Ende Ringe*. He considers these long, fibrillar prolongations the products of regeneration. The absence from the equation of neurilemma nuclei is noteworthy, and the fine, newly formed bloodvessels are supposed to exert the chemotactic influence and to prepare the path for the newly formed nerve fiber which clings to its outer surface, showing here the expanded end-bulbs.

Ballance and Stewart[6] say: "The more the specimens are studied the more is the conclusion forced upon the mind of the observer that for the regeneration of a peripheral nerve fiber (not only the axis cylinder, but also the medullary and neurilemma sheaths) the activity of one variety of cell, and one variety only, is responsible. That cell is the neurilemma cell." These investigators further submit that the reasons we do not have any regeneration in the axones of the central nervous system is that in this locality there is an absence of neurilemma nuclei.

Marinesco[7] holds that there is no *régénérescence autogène* in the sense that there occur islets of new-forming axis cylinders and medullary sheaths in the distal part of a divided nerve. He thinks that the new nerve fibers in the distal part are prolongations from growing tissue in the proximal end. In speaking of experimental cases in which nerves were divided and their proximal portions removed, microscopic examination later demonstrating newly formed fibers in the distal portion, he evidently does not consider that he weakens his theory by naively stating: *De pareils cas sont d'autant*

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[4] Ueber das Verhalten der Achsenzylinder in Geschwülsten des Nervensystems und in Kompressionsgebieten des Rückenmarks, Jour. f. Psychol. und Neurol., 1906, vii, 101.

[5] The Healing of Nerves. Macmillan & Co., Ltd., 1901.

[6] Loc. cit., p. 89.

[7] Etude sur le mécanisme de la régénérescence des fibres nerveuses des nerfs périphériques, Jour. f. Psychol. und Neurol., 1906, vii, 140.

plus difficiles à interpréter que les cellules d'origine du bout arraché sont complètement atrophiés.

The raison d'être of this seeming digression from the title of this paper lies in the presentment of the leading thoughts on the subject of nerve regeneration. It makes a considerable difference in the way we view trauma and tumor involvement of the central nervous system if we accept the opinion of Bielchowski. As I have said, we have to admit a capability on the part of the central neuron of autorestoration (not the régénérescence autogène which Marinesesco denies); likewise, it seems to me that it is axiomatic that the nerve cells and their processes, axis cylinders as well as dentrites, in the central nervous system must be amenable to the same laws of wear and tear and death that govern cells elsewhere in the body. The large, pyramidal cells of the motor cortex, for example, are limited in their length of life, and when their usefulness is past, phagocytic action removes them and their work is assumed by others. Such a theory presupposes a constant appearance of new neurons. The supply of the perikaryon might be from the development of the many small and insiginficant somatochrome cells with which the gray matter throughout the central nervous system is studded. But the axis cylinder cannot be so easily accounted for unless we accept the idea of the growth from the cell body. The evidence seems to point to the fact that a limited amount of regeneration in the central nervous system is possible after trauma under favorable conditions. But this regeneration is too insignificant to be of functional importance.

Through Dr. Spiller's kindness I have been enabled to study the spinal cord of a case which was in his service in the Philadelphia General Hospital, and which bears interestingly on the question of slight structural changes accompanied by grave symptoms. The case is one of 11 embodied in a paper by Spiller and Weisenburg.[8]

The patient, a woman, aged about forty years, ten months after the removal of her left breast for carcinoma, began to suffer from radiating pains across her chest and back, as well as in the lower limbs. One month after the onset of these symptoms she suddenly became paralyzed in her lower limbs, and was confined to her bed. She complained of a girdle sensation, but did not suffer extreme pain. The upper limbs were not involved. There was no motion whatever in her lower limbs, which were the seat of flexor contractures, the thighs on the abdomen, the legs on the thighs. The patellar and Achilles tendon jerks could not be elicited. Babinski reflex was present on both sides. Sensation for touch and pain was lost in the lower limbs and trunk up to a line three inches below the umbilicus. Occasionally pin prick would be recognized on the dorsum of each foot. Incontinence of urine and feces was present. She died almost two months after the onset of her paraplegia, and therefore sufficient time had been given for secondary degeneration. The diagnosis of vertebral carcinoma in the thoracic region was ratified at the necropsy.

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[8] Carcinoma of the Nervous System and the Report of Eleven Cases, Jour. Nerv. and Ment. Dis., August, 1906.

In studying the spinal cord microscopically, I expected to find very well-marked degeneration and wholesale destruction of tissue through pressure. Sections were made at intervals from the third thoracic segment down to and including the first lumbar segment and stained by the Weigert hematoxylin as well as the hemalum-acid fuchsin methods. To the unaided eye there was none of that yellowish color in the Weigert sections which betokens degeneration. Under the microscope there were seen comparatively few swollen axis cylinders and swollen medullary sheaths in the lateral and posterior columns. There were also found here and there a few spaces from which it appeared that axis cylinders had dropped. There was a moderate number of granular cells. The chief point of interest is that the spinal cord which appeared so little altered even microscopically had in reality ceased to be a conducting mechanism.

I think that we are justified in assuming that had this condition been caused by a fracture-dislocation instead of a rapidly increasing malignant growth, the patient, in course of time, would have shown some return of function, which would have been ascribed by certain observers to regeneration after complete transverse lesion.

It is, indeed, remarkable that the spinal cord can so completely suspend its function, at the same time presenting so slight evidence of organic change. And it should make us particularly careful in giving a positively bad prognosis as to return of function in cases which have presented for some months symptoms of complete transverse lesion.

REVIEWS.

Light and *X*-ray Treatment of Skin Diseases. By Sir Malcolm Morris, F.R.C.S. (Edin.), and S. Ernest Dore, M.D. (Cantab.). Chicago: W. T. Keener & Co., 1907.

This little book is the best summary, thus far published, of the modes of application of the various forms of "light treatment," of their modification, of the cases to which they are or are not adapted, and of the results that have been attained by their use. This is followed by a full consideration of the therapeutic properties of the *x*-rays, the authors restricting the term "light treatment" to that involving the employment of the chemical or actinic rays, that is, the blue, visible violet, and ultra-violet rays, or, in other words, the therapeutically active rays. The small proportion of yellow and green which may take part in the effect may be neglected. With the red and infra-red, or heat rays they were not concerned, except in regard to excluding them from acting upon the skin.

The underlying principles on which the so-called "Finsen" light treatment rests are: (1) Light, and especially the actinic rays, is a stimulant of organic life. (2) These rays can cause a genuine dermatitis. (3) They are bactericidal, and this action increases in direct proportion to the degree of concentration of the rays. (4) Light can penetrate the skin, as is shown in "trans-illumination." (5) The evidence as to the protective value of pigmentation in animals, the results of the exclusion of the chemical rays in variola, and the microscopic tissue changes caused by light constitute collateral testimony to its possible power as a therapeutic agent.

As to the results in lupus, the authors' summary is most interesting. When a general infection is present, the whole mass of blood containing the bacilli and multiple foci developing, the light treatment is powerless. When the disease is limited to a small patch, and does not penetrate deeply into the tissues, Finsen's method is decidedly superior to any other, for the lupous tissue can be destroyed without pain or subsequent scarring. Even when the patch is extensive it often yields without the disfigurement caused by caustics or the knife, and without the local hypervascularity often following the *x*-rays. When the disease is rapidly spreading, the destructive action of the light, to which only a very small area can be exposed at a sitting, is altogether insufficient to keep pace with its advance.

In such circumstances Finsen's method requires to be supplemented by the x-rays, which can be applied to the whole or a large part of the affected surface.

In fact, in all the authors' cases, except those in which the patches were small and superficial, the two agents were used in combination. They say: "It is in cases in which the face is the seat of non-ulcerated lupus of limited extent, and especially when no previous treatment has been employed, that light is most effective. When the greater part of one or both cheeks is invaded, the x-rays should be used. Much time may, as we have had occasion to observe, be lost by attempting to treat extensive patches by Finsen's method alone."

In ulcerating lupus the x-rays were usually very serviceable, while the light was often ineffective. In rodent ulcer in the pre-ulcerative stage and of small size—up to an inch in diameter—the results of the combined treatment, or of x-rays alone, were satisfactory, though in the majority there were slight relapses before permanent cure was obtained. In the fully ulcerated cases and in those with deep penetrations (to periosteum, or bone, or mucous membrane) healing was still procured, but in most of them small foci remained and tended to enlarge. Radium was then found useful.

In carcinoma, except as to the relief of pain and lessening of discharge, the x-rays in their hands, as in those of most others, have been disappointing. In cancer, therefore, and in sarcoma and Paget's disease as well (on account of the danger of delay), they should be a last, not a first resort. In keloid they think x-rays "worth a trial." The results in many other diseases (most of them more purely dermatological) are recorded in an interesting and instructive manner.

The authors' conclusions as to the whole subject may be unreservedly subscribed to: that "Finsen has made a most valuable addition to our therapeutic resources in dealing with certain diseases of the skin, but that, like every other remedy, his method is neither infallible nor free from serious drawbacks. The same thing may be said of the x-rays, and still more emphatically of other methods, such as high-frequency currents, radium, etc. But used in combination, with special adaptation to special conditions, they give results which a few years ago would have been altogether beyond the reach of medical art." J. W. W.

Abdominal Hernia, its Diagnosis and Treatment. By W. B. De Garmo, M.D., Professor of Special Surgery (Hernia) in the New York Post-Graduate Medical School and Hospital. Pp. 458; 225 illustrations. Philadelphia and London: J. B. Lippincott Co., 1907.

From an experience with abdominal hernia extending over a period of twenty years or more, and embracing in all over 1400 operations for its relief, Dr. DeGarmo has written this book for the family physician. He has confined himself almost entirely to statements of accepted facts, has simplified both the anatomical and the purely surgical discussions as much as was possible, and has thus produced a text-book, which in spite of its occasional tendency to diffuseness and garrulousness, is a valuable and largely original contribution to surgical literature.

Probably the most valuable portions of the work are those dealing with the mechanical treatment of the various forms of hernia. This does not imply that the author is partial to the use of a truss. On the contrary, he urges that operative treatment for the cure of the deformity be adopted in every case unless such a course is positively contra-indicated; but he is rightly of the opinion that the physician or the surgeon, rather than the instrument maker, should select and should personally see to the adjustment of some form of efficient and comfortable support for this small minority of patients. Most surgeons will find a perusal of these chapters profitable. He says fully 95 per cent. of inguinal herniæ in infancy can be cured by a truss, provided it fits properly when applied, and is changed from time to time as the patient grows. He thinks nearly all cases of umbilical hernia in patients under five years of age can be cured by suitable support.

While no attempt is made to discuss internal herniæ, which the author thinks belong rather to intestinal surgery, he has not neglected the various complications of external herniæ. Among these may be mentioned misplaced testicle; interstitial hernia; the presence in the sac of the bladder, ovary, uterus, appendix, etc. By "sigmoid" and "cecal" hernia, he understands not the presence of those portions of the bowel in an ordinary sac, but a retroperitoneal hernia in which the structure involved has slipped down into the inguinal canal or the scrotum.

After discussing inguinal, femoral, and umbilical herniæ, short chapters are devoted to ventral hernia, and to such rare forms of hernia as lumbar, obturator, sciatic, vaginal, perineal, etc. Strangulated hernia is last discussed. He holds that "taxis," if tried by the physician first called, should not again be attempted by any other surgeon, no matter how skilful he may be, as it will be impossible to know the extent of the damage done by the first. Even moribund patients should be operated on, without any anesthetic in the worst cases; he reports several patients thus rescued from the grave. He reports 43 operations for all forms of strangulated hernia, with 9 deaths, including 1 death among 28 operations for strangulated femoral hernia. He states that among 110 operations for the radical cure of femoral hernia, there was only one recurrence noted. Two other supposed recurrences proved to be only subperitoneal lipomas. It is not stated how long the patients were traced.

Although there are included some rather extraordinary illustrations, yet further study of the volume removes the unpleasant impression received at first sight. A. P. C. A.

TRYPANOSOMES AND TRYPANOSOMIASES. By A. LAVERAN, Membre de l'Institut et de l'Academie de Médecine, Paris, and F. MESNIL, Chef de laboratoire à l'Institut Pasteur. Translated and much enlarged by DAVID NABARRO, M.D., B.Sc., D.P.H. Lond., Royal Society Commissioner for the Study of Sleeping Sickness in Uganda, 1903. Pp. 520; 81 figures in the text; one colored plate. Chicago: W. T. Keener & Co., 1907.

WHEN Laveran and Mesnil published their book upon trypanosomes in 1904, it contained practically everything that was known at that time about the subject; but so great has been the extent of research upon these organisms and so important the results of these researches in the last few years, and indeed months, that Dr. Nabarro, in order to bring the book up to date, was obliged to make numerous additions to every chapter. He very wisely has not attempted to edit the book, but has translated the original as it stood and has always enclosed his additions in brackets. Owing to this fact we have a good translation of the original French edition with additions which are exceedingly valuable and today absolutely necessary. By incorporating this new material Dr. Nabarro tells us that he has increased the book to more than one-half its original size.

To those who are at all interested in trypanosomes, Laveran and Mesnil's book must be very familiar, so that it is only necessary to give some idea of the book as it stands in this English edition. The arrangement has not been altered, though one entire chapter, on treatment, has been interpolated, and follows the section on human typanosomiasis. In the earlier part of the book, Nabarro has added discussions upon the relationship which spirochetæ and the Leishman-Donovan bodies bear to the trypanosomes. These disputed questions he leaves open. Other important additions are paragraphs upon several new forms of trypanosomes, the occurrence of flagellates in tsetse-flies, mosquitoes, etc., and the possible relation of these parasites to the sexual forms of the trypanosomes of the vertebrates, and the pathology of sleeping sickness. But it is almost impossible, in a few words, to give any idea of the additions, for new matter is to be found on every page of the book. The bibliography is practically complete up to the time the book was published, so that as a work of reference it is invaluable. W. T. L.

PROGRESSIVE MEDICINE. A QUARTERLY DIGEST OF ADVANCES, DISCOVERIES, AND IMPROVEMENTS IN THE MEDICAL AND SURGICAL SCIENCES. Edited by HOBART AMORY HARE, M.D., Professor of Therapeutics in the Jefferson Medical College. Assisted by H. R. M. Landis, M.D., Demonstrator of Clinical Medicine in the Jefferson Medical College, Philadelphia. Vol. I, March, 1908; pp. 284; 11 illustrations. Philadelphia and New York: Lea & Febiger, 1908.

THE first section of the March, 1908, issue of *Progressive Medicine* consists of an exceedingly valuable discussion of recent advances in the surgery of the head, neck, and thorax, by Charles H. Frazier. Especial interest and importance pertain to the discussion of the surgery of the brain, both of which are increased by personal comments by Dr. Frazier, based upon considerable experience. Among many important subjects discussed in the 116 pages are tumors of the brain, traumatic lesions of the brain, trifacial neuralgia, tumors of the face and tongue, tuberculosis of the glands of the neck, cervical rib, diseases of the thyroid, carcinoma and other tumors of the breast, surgery of the lungs, empyema, bronchoscopy, surgery of the œsophagus, and surgery of the heart. Dr. Robert B. Preble contributes an interesting section of 46 pages on the infectious diseases, including plague, cerebrospinal fever, diphtheria, dysentery, influenza, malaria, pneumonia, rheumatism, scarlet fever, tetanus, tuberculosis, and typhoid fever. Dr. Floyd M. Crandall contributes a section of 30 pages on diseases of children, including various disorders of the newborn, disorders of digestion, infant feeding, etc. Dr. D. Braden Kyle contributes a section of 43 pages on diseases of the nose and throat, and Dr. Arthur B. Duel a section on diseases of the ear. The volume as a whole will well repay careful reading. A. K.

ELECTROTHERAPEUTICS AND RÖNTGEN RAYS. By MIHRAN KRIKOR KASSABIAN, M.D. Pp. 545. Philadelphia and London: J. B. Lippincott Company, 1907.

THE object of this book, as indicated by the author, is to present the important facts pertaining to electrotherapeutics and the Röntgen-rays. He begins by giving a short historical sketch of the use of electricity, which is followed by an exposition of the elementary principles of electricity and magnetism. He then goes into the nature and properties of electricity, giving definitions, and explains in detail the static, galvanic, and faradic currents, the instruments used, and the methods of application. He then discusses the uses of the different forms of currents, both for diagnosis and the practical applications in diseased conditions.

There is no subject which lends itself more to charlatanism than electricity, and we are constantly surrounded by men who use it as a means for illegitimate practice. It is important, then, to have a work which clearly states the proper uses of this mode of treatment; and, as the author states in his preface, there is no one book which tells the general practitioner which current, how and when to use it, in any and every given condition. This is not the fault of the text-book writer, but is true because no one man can possibly know how to treat every form of disease, even though he spends his entire time in electrotherapeutics.

The author, who makes a specialty of Röntgen-ray diagnosis and therapy, gives us a short and brief exposition of the use of electricity in every possible disease, and in the majority of instances he quotes others. It is true he has been careful in his selection of those whom he quotes, but in spite of it many errors have crept in. The truth of the matter is that no one is qualified to write a general book on electrotherapeutics, for this branch, more than many others, lends itself to specialism. The man who treats nervous diseases electrically cannot and does not know the value of electricity in gynecology or skin diseases. In this book, for instance, the author quotes that Prof. Leduc has cured tic douloureux by three séances of electrolytic introduction of salicylic ions. Again, when talking of the treatment of hemiplegia, he states that "vigorous electrization of the affected limbs may completely restore them; further efforts may be directed to the cranial lesion by the application of the continuous current," etc., etc., and, continuing, "If aphasia be associated, the anode may be applied to the third left frontal convolution. I prefer the static breeze over the head, with indirect sparks to the affected side." Absurd advice, for no amount of electrization will ever remove a hemorrhage anywhere, much less in the brain. Again, discussing the treatment of epilepsy, the author advises the administration of the static current in the form of wave and breeze over the head, and states that in his experience it has done some good; and he also states that the various forms of insanity are, at times, favorably influenced by using the same treatments as are referred to in the preceding paragraphs. This, of course, cannot be. Insanity cannot be benefited by any form of current, whether applied to the head or anywhere else.

The chapter upon the principles and uses of high-frequency currents is very good, but here also there is repeated quoting of the opinions of others.

The second part of the book is concerned with Röntgen-rays, and is distinctly the best part of the work. The author's well known and long experience with the Röntgen-rays makes his statements authoritative, and this part of the book is excellent. He begins with an historical introduction, and then gives a comparative study of the properties of the cathode and the Röntgen-rays. He details the various forms of Röntgen-ray apparatus used, the manipulation of the instruments, the fluoroscope and accessories, and gives good advice as to the selection and installation of the x-ray apparatus. He then, in great detail, gives the principles of technique of fluoroscopy, skiagraphy, photography, the interpretation of x-ray negatives, and of stereofluoroscopy and skiagraphy.

In the next chapter he discusses the clinical application of the Röntgen-rays, taking up in detail fractures, dislocations, and diseases of the osseous system, tumors of the soft tissue, the articulation system, and foreign bodies and their localization. He then discusses the application of the x-rays in diseases of the thoracic and abdominal organs, and then of the various specialties, and in dentistry.

The last part of the book is concerned with radiotherapy, radium, and phototherapy, and lastly in the appendix is given a study of the technique employed and the remarks made by many leading exponents of Röntgen-therapy in this country and in Europe.

The book, on the whole, is good, and is a distinct and valuable contribution to the literature on electrotherapeutics and Röntgen-rays. T. H. W.

INTERNATIONAL CLINICS. A QUARTERLY OF ILLUSTRATED CLINICAL LECTURES AND ORIGINAL ARTICLES. Edited by W. T. LONGCOPE, M.D. Seventeenth Series. Vol. I, pp. 318; Vol. II, pp. 312; Vol. III, pp. 296; Vol. IV, pp. 308. Philadelphia and London: J. B. Lippincott Co., 1907.

International Clinics continues to merit the favor of the profession. Each of the four volumes of the seventeenth series has contained a number of very valuable articles of wide diversity in interest —treatment, medicine, surgery, neurology, pediatrics, obstetrics, gynecology, orthopedics, pathology, dermatology, ophthalmology, otology, rhinology, laryngology, hygiene, etc. If most of the articles appeal especially to the general practitioner, this is distinctly in favor of the publication, since it is the general practitioner that the editor has particularly in mind when arranging the contents; but in addition, the general progress of medicine, in its scientific as well as practical aspects, is obvious in the volumes, especially in that which contains a review of progress during the preceding year. The articles are too numerous even for mere mention; without suggesting that the others are of less merit, perhaps attention may be drawn to the following as of especial interest and importance: The Psychic Treatment of Some Functional Neuroses, by

L. F. Barker; The Clinical Diagnosis of Enlargement of the Thymus, by A. S. Warthin; Opening the Pleural Cavity without Pneumothorax, by Th. Tuffier; The Vaccine Treatment of Infectious Diseases, by R. I. Cole; Perforated Duodenal Ulcer, by H. S. Clogg; Practical and Theoretical Considerations Concerning Dietetics, by D. L. Edsall; Common Cardiac Arrhythmias, by A. B. Hewlett; and the Urgency of the Early Diagnosis of Cancer of the Stomach, by A. McPhedran. A. K.

Diseases of the Nose. By Earnest B. Waggett, M.A., M.B., B.C., Surgeon to the Throat and Ear Department of the Charing Cross Hospital, London. Pp. 282. London: Henry Frowde, Oxford University Press, 1907.

Diseases of the Larynx. By Harold Barwell, M.B., F.R.C.S., Surgeon for Diseases of the Throat, St. George's Hospital, London. Pp. 266. London: Henry Frowde, Oxford University Press, 1907.

Diseases of the Ear. By Hunter Tod, M.A., M.B., F.R.C.S., Surgeon to the London Hospital, London. Pp. 317. London: Henry Frowde, Oxford University Press, 1907.

These three books, although published separately, are uniform in aim and in their general treatment of the subjects considered in them, and accordingly may be conveniently grouped for review. They are all written to meet the needs of the student and general practitioner and for that reason references to the literature of the subject are avoided, and theoretic topics are left in the background. Although the books are not large, each one of them covers its subject in as complete a manner as may be demanded by those for whom they are written.

Mr. Barwell's book on *Diseases of the Larynx* commends itself most highly to the reviewer. The author goes right to the heart of his subject in every instance, and his book shows evidence of a large amount of original work on the part of its author, and of a very extensive experience in laryngeal diseases. Almost every page bears the impress of the author's personality, and it is a great pleasure to feel that what we read has been written by one who is so evidently a master of his subject. Mr. Barwell's literary style is particularly concise and lucid. and eminently adapted to the style of work he has written. The illustrations of the various laryngeal conditions are most excellent. Although not very numerous, we have rarely seen them collected with such scientific accuracy and artistic perfection. We regret that we cannot afford as much praise to the other two volumes.

Mr. Waggett states in his preface: "These pages are intended to be read as they were written, rapidly from cover to cover" and we regret to state that there is evidence on every page of haste in the writing, if not of care in the correction of what has been written. A curious tendency which is very manifest on the part of the author is to recommend various kinds of auto-experimentation of a most disagreeable character. Thus he advises the beginning rhinologist to have his nasopharynx palpated by an expert, and subsequently by a novice, in order to ascertain how uncomfortable the procedure may be made. Some pages later he advises us how to ascertain the manner of onset of a cold. The page is worth quoting, although we trust but few will be tempted to perform the experiment. "Choose a moment when your nose feels perfectly well, to commence it. Sit down in an overheated room in your indoor clothes with thin socks upon your feet and no boots; open the window to the raw winter evening's air and arrange for a draught slowly to chill the lower part of your person. You probably at first experience no discomfort at all, but after an interval you will find your nose feeling unduly dry and patent. After an hour or so you will find the nose becoming blocked and a sense of dragging weight is felt about the eyes. A little later your nose will begin to run clear fluid, and if you examine this you will find that it contains microörganisms in small growing clumps." The book contains a good explanation of the physiology of respiration. The pictures, which the author states he drew expressly for this work, are very crude and while the majority may express the author's view to himself, they certainly would not do so to anyone else.

The manual of *Diseases of the Ear* by Hunter Tod is much less original in its scope than either of the other two books. It is very similar in character to many other manuals which have appeared in recent years, intended for the use of the student and practitioner, and presents no special points to which particular attention should be directed. The author has a clear and pleasing style, and he has covered the subject very thoroughly. It may be recommended as a good, safe guide for the beginner in otology.

F. R. P.

A Practical Treatise on Fractures and Dislocations. By Lewis A. Stimson, B.A., M.D., LL.D., Professor of Surgery in Cornell University Medical College, New York. Fifth edition; pp. 847; 352 illustrations, and 52 plates. New York and Philadelphia: Lea Brothers & Co., 1907.

In the new fifth edition of Stimson's *Treatise on Fractures and Dislocations* considerable new matter and many new illustrations have been added. The new matter relates chiefly to fractures of the upper end of the radius, of the carpal and tarsal bones, and of dislocations of the semilunar cartilages. The text on these subjects is entirely up to date, and all of the recent literature on these heretofore obscure lesions is thoroughly reviewed. The high standard of this work is so well known to the profession that it is unnecessary to add anything in review, except to say that as a guide in the treatment of fractures and dislocations it is invaluable, not only to the general practitioner and student, but also to the specialist.

J. A. K.

ATLAS AND TEXT-BOOK OF HUMAN ANATOMY. By DR. JOHANNES SOBOTTA, Professor of Anatomy in the University of Würzburg, Germany. Edited, with additions, by J. PLAYFAIR MCMURRICH, A.M., Ph.D., Professor of Anatomy in the University of Toronto. Vol. III; pp. 342; 297 illustrations, mostly in colors. Philadelphia and London: W. B. Saunders Co., 1907.

VOLUME III, the concluding volume of Sobotta and McMurrich's *Atlas and Text-book of Human Anatomy,* is fully abreast of the others, both in general excellence and in pictorial display. It treats of the vascular system, the lymphatic system, the nervous system, and the organs of special sense. The peripheral nerves and the bloodvessels have been depicted as the student finds them in the dissecting room—that is, together in the one region, so that the book may be used as a guide to dissecting as well as a topographical atlas. As we have said of the illustrations in Volumes I and II, so may we say of those in Volume III—they are unsurpassed; many of them really are works of art. The text, although somewhat subordinate to the illustrations, as is eminently proper in an atlas, is more than sufficient; it has the worthy feature of not being prolix. Such, indeed, are the merits of the three volumes that student, physician, and surgeon alike may use them to advantage as an atlas and as a text-book.

A. K.

TROPICAL DISEASES. By SIR PATRICK MANSON, K.C.M.G., M.D. LL.D. (Aber.). Fourth edition; pp. 876; 241 text illustrations and 7 plates. New York: William Wood & Co., 1907.

THIS well-known and justly prized manual comes to us in its fourth edition much revised, improved, and somewhat increased in size. The first edition was issued in 1898, since which time there has been unusual activity in the study of diseases of warm climates. Much has been accomplished, of which the most important, as pointed out by the author, consists of the definite installation of the mosquito as a leading factor in tropical pathology; the establishment of the mosquito-malaria theory; the discovery of the relationship of this insect to yellow fever; the discovery of the precise way in which Filaria bancrofti is inoculated by the mosquito; the discovery of a trypanosome in man, and its relation to sleeping-sickness; the discovery of an unsuspected route by which Ankylostomum duodenale gets access to the human intestine; the discovery of the nature and germ of kala-azar and tropical sore; the discovery of a new form of relapsing fever and of its transmitting agent; the definite establishment of the rat flea as the communicator of plague; etc.—all of which and much more is well set forth in the book. This manual, by a pioneer, continues to be, as it has been, the best on the subject in the English language, and it is earnestly commended to the attention of all physicians interested in a field of medicine that has yielded up much in the past and from which much more may be expected in the future. A. K.

GREEN'S ENCYCLOPEDIA AND DICTIONARY OF MEDICINE AND SURGERY. Edited by J. M. BALLANTYNE, M.D. Vol. III: EARTH BURIAL TO GUMMI INDICUM. Pp. 535. Vol. IV: GUM RESINS TO INTUSSUSCEPTION. Pp. 560. Vol. V: INULIN TO LUMBAR PUNCTURE. Pp. 536. Edinburgh and London: William Green & Sons, 1907.

WE have already given a favorable notice of Volumes I and II of Green's Encyclopedia. Volumes III, IV, and V contain, in addition to dictionarial matter, many articles of much value, especially the following: Eclampsia, ectopic gestation, eczema, embryology, epidemiology, diseases of the eye, feces, food, fractures, gastro-intestinal disorders of infancy, female organs of generation, gout, diseases of the heart, hernia, hysteria, infant feeding, infection, inflammation, insanity, diseases of the intestines, jaundice, diseases of the joints, diseases of the kidneys, labor, diseases of the larynx, leukocytosis, and diseases of the liver. But they contain much more—Volume III, 1097 subject headings; Volume IV, 872; and Volume V, 908. Dr. Ballantyne and his collaborators have done their work well, and the encyclopedia may be recommended as an exceedingly useful work, especially for purposes of reference. A. K.

PROGRESS
OF
MEDICAL SCIENCE.

MEDICINE

UNDER THE CHARGE OF
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The Ophthalmic Reaction in the Diagnosis of Typhoid Fever.—A. Chantemesse (*Gaz. méd. de Paris*, 1907, x, 2). The recent announcement of the use in diagnosis of the skin reaction in tuberculosis and the recent reviews of the ophthalmic reaction to tuberculin and its influence on diagnosis, led Chantemesse to work along the same lines in typhoid fever. As a result, he concludes that the ophthalmic reaction thus obtained is a very reliable and early sign. He obtained his typhotoxin by treating cultures of Bacillus typhosus with absolute alcohol. This precipitate is afterward powdered and used in a watery solution, the dose being about $\frac{1}{50}$ mg. This solution, a drop of which is put in the eye, gives quite a marked reaction, as does a tuberculin instillation. In patients with typhoid fever or convalescent from it, there is congestion, lacrymation, and a serofibrinous exudate. The maximum reaction is attained in from six to twelve hours after the instillation; it may be noticed for twenty-four hours or even a little longer at times, even to three days. In healthy persons and in those suffering from other diseases there is usually slight congestion and lacyrmation, but this always disappears in from four to six hours, and in twenty-four hours the eye instilled is as clear as the normal eye. Just how early this reaction can be obtained is not known, but Chantemesse has shown that in rabbits the reaction may be obtained forty-eight hours after the subcutaneous injection of typhoid cultures. The healthy rabbit showed no reaction; this was also true of the healthy human subject. This reaction, then, is a very valuable sign, and if proof of its reliability is forthcoming it should recommend itself on account of its simplicity when compared to the Widal reaction (which is often so late in its appearance) and to blood cultures.

Experimental and Clinical Investigation of the Pulse and Blood-pressure Changes in Acrtic Insufficiency.—Hugh A. Stewart (*Archives of Internal Medicine,* 1908, i, 102). The frequency with which the sphygmograph produces a seemingly normal tracing in cases of perfectly definite aortic insufficiency, when the sensation to the fingers is that of a collapsing pulse, and the fact that this is often blamed on the instrument or on the simultaneous occurrence of an aortic stenosis, led Stewart to an exhaustive study, both experimentally and clinically, of the pulse and blood pressure changes in aortic insufficiency. His conclusions are that the work of Henderson is confirmed in that the cardiac cycle in not diphasic, but triphasic, and consists of systole, the period of ventricular discharge, diastole, the period of ventricular relaxation and filling, and diastasis, the period of rest. The effect of the production of aortic insufficiency on the dog is to increase the amount of aortic systolic output by only a fraction of a cubic centimetre of blood. The volume of the blood which regurgitates is negligible. The transmission of pressure to the ventricle increases the ventricular tonus. It also produces a reflex inhibition of the vasomotor centre. The fall in pressure in aortic insufficiency is due to the diminished peripheral resistance, and is not caused by a loss of blood from regurgitation. The increase of pulse pressure, the difference between maximum and minimum pressure, is due to the lowering of the diastolic pressure. There is no increase in the systolic pressure. The main fall in pressure during systole is due to an increased blood flow through the capillaries. So long as the tonus of the ventricle is maintained, the slowing of the heart rate does not favor increased regurgitation.

Trichomonas Hominis Intestinalis.—Hugo A. Freund (*Archives of Internal Medicine,* 1908, i, 28). The importance of the various flagellate organisms which at times inhabit the intestines in relation to diarrhœal disorders is quite often overlooked, and may frequently be at the bottom of some obscure enteric disturbance. In the last few years considerable literature has appeared on this subject, mostly from foreign sources. Freund has carefully reviewed this, and also discusses the biology and pathogenicity of this organism in 10 cases which came under his notice. These had a variety of complaints, some, however, relating solely to intestinal disturbance; others presenting the picture of some organic change. The organism does not seem to be pathogenic at all times, yet the fact that it thrives best in an alkaline medium, and that the normal gastric juice is destructive to the parasite as well as its cysts, may account for this occasional lack of pathogenicity. The reported cases, however, seem to indicate the existence of a definite flagellate diarrhœa, especially in children. The symptoms at the onset in acute cases are usually abdominal pain, colicky in character, reaching from side to side and more or less constant. At its height nothing relieves it except opiates. The stools are usually very frequent, unformed, and of fluid consistency. In these latter stools the flagellates are most common. The probable manner of infection is through the food and drink, whereby the spores are ingested. The organisms are most common in the lower small intestine and upper colon, and the latter place is the most common site of the ulcers and round-cell infiltration. As regards treatment, calomel is most efficacious, especially in small, daily repeated doses of tenths of a grain, following which the diarrhœa diminishes, the pain ceases, and the patient rapidly recovers. Many other drugs have been tried at different times with varying success. Freund concludes that the trichomonad is the direct cause of certain forms of acute, chronic, and recurring enteritis characterized by abdominal pain, diarrhœa, loss of weight and strength, with slight temperature at times and anemia. Whatever may be the immediate result of its injection into the intestinal tract, it is true that the disappearance of, or a great reduction in, the number of organisms results usually in a marked lessening of the symptoms and complete recovery.

Experimental Study of the Action of Oil in Gastric Acidity and Motility.—D. M. Cowie and J. F. Munson (*Archives of Internal Medicine*, 1908, i, 61). The fact that for many years the knowledge concerning the action of the various drugs and remedies administered in the treatment of stomach disorders has been deduced from the results of purely empirical procedures, and that, although some of these methods have been fairly accurate, yet others are subject to more or less criticism, led Cowie and Munson to experiment along these lines, especially in regard to olive oil and its effects on the stomach. (This has been used by them for some years as a routine treatment for hyperchlorhydria, and with very favorable results.) It was an ancient idea that fats retard digestion, but modern experimentation and research have shown the real influence of fats upon the acidity of the gastric juice. The authors, after a long series of experiments, conclude that oil depresses the secretion of the stomach by reflex central action. This action is unlike that of ordinary food stimulation in that it is slower; the reflex central action is a quantitative one, the depression becoming greater as the amount of oil administered is increased. Oil depresses the secretion of the gastric glands by mechanical inhibition of food stimulation, by coating the food and by coating the stomach wall, and in proportion to the rapidity with which the walls of the stomach are covered with oil, the inhibition of secretion occurs from nervous as well as mechanical influences. Olive oil and cotton seed oil, when given in connection with the usual test breakfast, decrease the gastric acidity at the end of the hour and retard the evacuation of the stomach. The beginning of the secretion of hydrochloric acid is delayed when oil precedes the meal; unchanged when it follows the meal. The height of digestion is delayed when oil is given either before or after a meal, and the height of secretion is lowered when oil precedes the meal, but unchanged when oil follows the meal. If the progress of digestion is changed by the removal of small samples of stomach fluid at frequent intervals, it will be observed, when oil precedes the meal by half an hour, that at the end of what is usually taken as the digestive period for a test breakfast (three-quarters to one hour), the acidity is distinctly lowered; while as great a height as is present in the control meal is frequently reached some minutes later. The action of oil on the stomach functions is only a temporary one, which has no effect on subsequent meals unaccompanied by oil. The therapeutic value of oil is apparent in suitable cases; it is preferable to antacids because of its caloric value. In hyperchlorhydria it should precede the meal; in hypochlorhydria it should follow the meal. In stasis and persistent slow evacuation it should be eschewed; in hypermotility it may be given before, during, or after a meal.

Hemolytic Jaundice.—M. A. CHAUFFARD (*Sem. méd.*, 1908, xxviii, 49) states that the question of hepatogenous or hematogenous jaundice, whether the jaundice is due to biliary retention or to hemolysis, may at times be of great importance, especially when surgical interference may be necessary In a brief survey of the literature on this subject, he notes that extreme fragility of the red corpuscles has been often demonstrated in jaundice experimentally, even though the serum and plasma are apparently normal. In order to detect this condition easily the blood was examined in smears to see if there was any marked difference in the corpuscles, the specimens being dried and stained by the method of Pappenheim, without fixation. In this condition it was found that, together with the normal red blood corpuscles, there were a great many showing granular degeneration; some cells had lost their hemoglobin and were unusually large, but the majority of the corpuscles were smaller—3 to 6 μ in diameter. These are usually present, in very small numbers, in normal blood, but in cases of hemolytic jaundice they may represent 15 to 18 per cent. This, Chauffard says, is not so in an ordinary jaundice due to retention of bile, in which case the red blood corpuscles are not smaller or more fragile, nor do they show any granulations. By experimental work on animals (rabbits), Chauffard has produced, by the introduction of eel's blood serum, a condition similar to that in hemolytic jaundice; on examination he finds that these active changes in the red blood corpuscles go on in the red bone marrow. He reports several personal cases, and others from the literature, showing this condition in the blood, and notes its importance in certain cases in which surgical interference on account of its dangers should be avoided. The demonstration of the condition of blood smears is very easy, and is of great use in differential diagnosis of the cause of the jaundice in certain conditions; it may also have more or less direct bearing on prognosis.

The Acetone Bodies.—T. STUART HART (*Archives Int. Med.*, 1908, i, 219). During the last few years a great deal of work has been done on the acetone bodies, acetic acid, diacetic acid, and oxybuytric acid. If the acetone bodies are excreted in any considerable quantity, it is a positive evidence of improper metabolism. Aside from a knowledge of the sugar output, which is most important in diabetes, the presence first of diacetic acid and later of oxybuytric acid, is also of grave significance, indicating that metabolism is deranged and a condition of acid intoxication imminent. The quantitative determination of these bodies is often most important. In general practice the methods are rather complicated and lengthy. Hence Hart, seeing the need of simpler clinical methods, has devised a procedure based on the delicacy of the well-known test-tube reactions in urine containing the acetone bodies. The practical application of this method is as follows: The urine under examination is tested for Gerhardt's reaction. If this is positive, we know that diacetic acid and acetone are present in an amount, in terms of acetone, in excess of 0.200 gram per liter. If the reaction is very strong, we dilute the test solution with distilled water until the color approximates that of the standard ferric chloride solution, and this dilution, when compared in one of the author's tables, gives the amount in grams per liter. If the final dilution indicates an acetone content of 0.5 gram per liter or over, we may be reasonably sure that oxybuytric acid is present, and proceed to its determination by means of the polariscope. If Gerhardt's test is negative, we apply successively Arnold's, Legal's, and Lieben's tests in the order named. A positive Arnold reaction indicates something over 0.100 gram per liter of acetone. A positive Legal reaction indicates 0.030 gram of acetone per liter. Lieben's test, if positive, while Legal's is negative, indicates the presence of acetone in an amount within the normal limits. Hart reports 600 examinations of urine with the above methods, the tests for which he gives in detail, and in the various tables notes the results when compared with the more exact quantitative methods which he made in one hundred specimens by means of the Huppert-Messinger method.

Ochronosis.—EDGAR REID, WM. OSLER, and A. E. GARROD (*Quart. Jour. Med.*, 1908, i, 199) report a case of ochronosis in a woman, aged sixty-seven years, who complained of a large ulcer of each leg. She showed patches of dark pigmentation in the eyes and ears, and had been passing urine of a black color. The leg ulcers had been present for about thirty years, never healing. They were dressed by the patient with carbolic oil, 1 to 20, twice daily applied to the raw surfaces, this giving the greatest relief of any dressing. Six years previously she had first noticed that her ears and the whites of her eyes were turning black, and for about eighteen months previous to admission had noticed that her urine was occasionally black when first passed, and if not, turned so some hours afterward. On examination the skin of the face, neck, and hands was sallow; the eyes each showed two patches of bluish black pigmentation near the centre of the sclera. Both ears showed a large area of pigmentation involving the concavity of the anthelix and leaving the rest of the ear free. The hands showed this pigmentation along the extensor tendons about the metacarpophalangeal joints. There was no pigmentation elsewhere to be seen. The urine, which previous to admission had been very dark and showed a reducing substance, was, during the time in the hospital, of fairly normal color, even though the carbolic oil was used again in the dressings. After five months' treatment the pigmentation was much less marked than before and the ulcer was healing gradually. The fact that some of the reported cases of ochronosis give a history of many years association with carbolic acid makes it very probable that this pigmentation can be produced by the absorption of phenol in small and long-continued doses, especially as in this case the improvement was noticed when the applications were reduced and the surface of the ulcer was diminishing. Another point of interest in this case is the fact that only those portions of the body exposed to light showed pigmentation. From the study of the urinary condition in this and other cases, the nature and origin of the urinary pigmentation may, in some cases of ochronosis, remain obscure. There is, however, good reason to believe that in one group of cases the ochronosis is due to the metabolic error which is known as alkaptonuria, and in another to carboluria, as in this reported case. The clinical features group themselves under three headings—the pigmentation, the color of the urine, and the associated arthritis. The pigmentation is usually evident clinically in the sclerotics and the thinner external cartilages and tendons; only occasionally in the skin. The urinary condition, especially with the alkaptonuria group, has not infrequently led to the diagnosis of diabetes, but this mistake, with our added knowledge of the subject, ought not to occur. In the group with carboluria there is less chance for a mistake. In some of the reported cases there has been a chronic arthritis and more or less irregular joint troubles, in one leading to a very peculiar sort of waddling gait in walking. The plate accompanying this article and that of F. M. Pope, in the *Lancet*, 1906, i, 24, illustrates very beautifully the peculiar appearance and distribution of the pigmentation.

Certain Reflexes in Scarlet Fever.—C. Rolleston (*Quart. Jour. Med.*, 1908, i, 117), in view of the fact that lately the various reflexes in diseases other than those of the nervous system have been more or less studied, was led to make some observations in scarlet fever, which has been little studied in this respect. He bases his study on 175 cases of greater or less severity, and concludes that in many cases of scarlet fever the normal plantar response of flexion is temporarily replaced by extension. The more severe the case and the younger the patient the more likely is this change to occur, and, generally speaking, the severer the case, the longer the duration of the phenomena. In a few cases all plantar response was abolished. In a large number of cases, whatever the type of response first obtained, there was an interval of varying duration in which the plantar reflexes were absent. In some cases there was complete absence of the reflex, the muscles of the hip normally concerned in this response being as inactive as those of the foot. In others the hip reaction was brisk, while the muscles of the foot failed to respond. The epigastric and abdominal reflexes are also affected, and, as in the case of the plantar response, so here, the more severe the attack the greater is the liability of their being affected and the longer the duration of any such affection. The epigastric and abdominal reflexes are less frequently affected than the plantar. Usually, the epigastric and abdominal reflexes are contemporaneously affected. If there is a difference, the epigastric is more likely to show diminished activity or abolition than the supra- or infra-umbilical response. The cremasteric response is the briskest reflex of early youth, and is the least likely of all reflexes to be abolished. The knee-jerks were found to be absent in only three cases. All of these three belonged to the class regarded as "severe." Subjects affected with endocarditis showed more derangement of their reflexes than those afflicted with other complications of scarlet fever.

SURGERY.

UNDER THE CHARGE OF
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A Clinical Study of Appendicitis and Gastric Ulcer.—MAHNERT (*Mitt. a. d. Grenzg. d. Med. u. Chir.*, 1907, xviii, 468) says that if we study many cases of acute appendicitis originating, apparently suddenly and violently, with startling and sudden perforative peritonitis, we will find that in most cases, for weeks or months before, there have been repeated attacks of gastric disturbances with alternating diarrhœa, constipation, colicky pains, etc. A careful examination during this period would have shown the evidence of a diseased appendix, and an operation then would have saved the patient's life. Acute and chronic appendicitis can lead first to thrombosis of the veins of the appendix and its mesentery, and then of the omental veins. Emboli may break off from these thrombi and be conveyed to the stomach and duodenum, and there can lead to the development of erosions and small ulcers, and finally to the severe clinical picture of a chronic gastric ulcer. Mahnert asserts that his studies lead him to the conclusion that gastric ulcer occurs with startling frequency in cases of appendicitis. In 36 cases of gastric ulcer, 23 had chronic appendicitis, or 64 per cent. Acute appendicitis cases were not followed by gastric ulcer so frequently, because immediately on coming into the hospital they were committed to the surgical department. Appendectomy should, therefore, not be limited to acute cases of appendicitis, but should be done for the chronic also. Mahnert believes that both forms should be operated on as soon as they are recognized. In a large number of the chronic cases operation can be done under local anesthesia. In many cases, especially in those in which there have been preceding stomach symptoms, the stomach and the surrounding parts should be carefully examined.

Histological Studies on Bone Transplantation in Men.—AXHAUSEN (*Deut. Zeit. f. Chir.*, 1907) says that freshly removed and transplanted bone tissue will die entirely, except its periosteum, which will live and be capable of production. This probably is true also of the bone-marrow. The implanted piece of dead bone will gradually be replaced by newly formed bone. As to the source of this replacement, the most important factor is the transplanted periosteum. Of secondary importance is the part played by the medulla. Then comes, but only by transplantation into an ossifying bed, the bone formation of the walls of this ossifying bed. When decalcified bone is transplanted, only the third form of bone production occurs, and this only when the transplantation is made into a cavity having an ossifying surface, not when a large piece is transplanted into a defect of continuity in one of the long, hollow bones. For implantation in the latter cases freshly removed bone covered by periosteum is far superior to decalcified bone, and should always be employed. Further investigation must teach us how nearly we may obtain similar results from bone taken, under careful asepsis, from young cadavers.

Strangulation of the Small Intestine through a Rent in the Mesentery.—Bell (*Brit. Med. Jour.*, 1907, ii, 1710) reports a case of a boy, aged fourteen years, who was violently thrown from a bicycle, with resulting concussion and bleeding from the nose, but no other external signs of injury. The next morning there were present the signs of beginning peritonitis. On opening the abdomen, a coil of small intestine was found tightly strangulated through a rent in the mesentery. On removing the dressing on the second day, a bruise exactly the shape of a bicycle handle bar was clearly defined, and made it evident that the cause of the injury was the violent pressure of the handle bar at the time of the accident.

Pericolitis Sinistra, with Abscess Formation and Recovery.—Donaldson (*Brit. Med. Jour.*, 1907, ii, 1705) reports a case in which the patient was supposed to be suffering from malaria, and was at once put on a course of quinine. The condition improved for a day or two and then got worse again. Symptoms of severe peritonitis developed. Not improving under conservative treatment, an operation was contemplated. Then a slight movement of the bowels was obtained by enemas, and the expectant treatment was continued with the view of determining, if possible, the site of obstruction. Temporary general amelioration followed, although the abdominal distention continued. On about the ninth day from the beginning of the symptoms of obstruction an operation was performed. Three or four days previous to this, examination of the abdomen disclosed a small area of distinctly greater tenderness in the left iliac region, which was dull on percussion. This in the next three or four days became larger until it formed a somewhat oval patch measuring about three inches in its long diameter. Synchronously with this all the symptoms of acute obstruction returned. An incision was made in the long axis of the dull area, and by carefully working deeper an abscess was evacuated, such as one finds in purulent appendicitis. For fear of breaking down the localizing adhesions and infecting the general peritoneal cavity, it was deemed inadvisable to explore farther. Irrigation and drainage were employed. Later septic pericarditis complicated the case, but gradually the symptoms subsided and the wound healed. The conclusion finally reached was that this was a case of pericolitis, probably of the sigmoid flexure, ending in abscess formation.

The Hot-air Treatment after Abdominal Operations.—Gelinsky (*Zent. f. Chir.*, 1908, xxxv, 1) says that in Bier's hot air treatment we have an excellent means of exciting peristaltic movement, and of absorbing and preventing adhesions. He has employed it for a year with good results. From the day of the operation, the patient is exposed in the hot air apparatus daily, once or twice, rarely more frequently, to a dry heat of 120 to 150 degrees for twenty minutes. It is followed always by an abundant escape of flatus, and the patient feels much better. In 13 aseptic laparotomies, by a single employment of the hot air apparatus, peristaltic movement was started and none of the usual disturbances was observed. In 11 cases of infectious peritonitis following perforative gangrenous appendicitis, there were no cases of postoperative ileus. Ten recovered, and in only 2 did chronic adhesive peritonitis develop. After three and six weeks, respectively, by means of the hot air treatment, the patients completely recovered. One man, with free peritonitis and a bad, irregular pulse, died forty-eight hours after the operation. Even in this case the hot air treatment was followed by an abundant escape of flatus. The absorbing effect was prompt in 4 cases of adhesive peritonitis with the formation of exudate. In a man suffering from a double-sided tuberculous pleurisy and marked ascites, after evacuation of the latter by incision and hot air treatment for two months, he had so far recovered that the fever and effusion had disappeared and he was able to do considerable indoor work. The improvement has continued up to the present time, that is, five months.

Should Cholecystitis and Cholelithiasis be Considered Medical Affections, and what are the Usual Consequences of Treating them Medically?—NANCREDE (*Ann. of Surg.*, 1908, xlvii, 222) says that cholecystitis is an infective process which precedes the formation of calculi, and that with or without stone formation this disease of the gall-bladder implies certain dangers. While the most common form is produced by germs of low virulence, secondary infection with virulent organisms may take place, causing cholangitis—often a most fatal condition—or suppuration or gangrene of the gall-bladder with fatal peritonitis. Crippling adhesions of the stomach and intestines may produce persistent ill health, or even hopeless gastric dilatation. The absence of gallstones at an operation does not prove that none have been passed or preclude the probability of their new formation. Suppurative or gangrenous cholangitis may develop at any time from a chronic cholangitis. Early hepatic drainage will often prevent a lifetime of invalidism or avert death. Although serious capillary hemorrhage usually results from pronounced cholemia, an undetected and mild grade of cholemia preceding a comparatively short and slight jaundice may provide the necessary conditions. Nancrede says that in many of his cases chills, fever, and sweats were merely evidences of an infective process so located that its products could be readily absorbed. He is convinced that during an attack of biliary colic it is vastly more likely that a stone does not pass than that one does. The colic is frequently due to other obstructive causes. Chronic inflammation of the gall-bladder precedes and predisposes to the formation or reformation of gallstones, with all their dangers.

The Value of the Differential Leukocyte Count in Acute Appendicitis.—NOEHREN (*Ann. of Surg.*, 1908, xlvii, 239) states that blood examination in cases of acute appendicitis is of great value in determining the severity of the condition, and therefore deciding whether immediate operative interference is indicated. The degree of leukocytosis, formerly considered an important diagnostic aid, is too variable to be of any practical value. The relative disproportion between the percentage of polyneuclears and the degree of leukocytosis is reliable in the majority of cases, but the number of exceptions is so great that its practical value in determining immediate operation becomes very small. The estimation of the percentage of polynuclears alone is more reliable than either of the preceding methods, and therefore, together with the fact that it is one of the most easily made, the method to be recommended. A polynuclear percentage of 90 per cent. or more indicates a severe process that needs immediate operative interference; a percentage below 78 per cent. means a "safe" or mild process; a percentage between the two extremes speaks for the one condition or the other, according as it approaches the one extreme or the other.

The Treatment of Juxta-balanic Penile Hypospadias.—SOUBEYRAN (*Arch. gén. de chir.*, 1907, i, 497) says that the Beck-Bardenheuer-von Hacker operation for balanic hypospadias consists in dissecting free the anterior end of the urethra, making a suitable tunnel through the glans, passing the end of the freed urethra through this perforation and suturing it to the glans in the position of the normal meatus. This has given excellent results in the hands of a number of operators. It is applicable, however, only to cases in which the deficiency is only about a centimeter long. Soubeyran has successfully applied the operation, slightly modified, to a case in which the abnormal meatus was more posterior. A narrow collarette of skin around the open end of the urethra was dissected free with the urethra, which was freed for about 3 or 4 cm. The spongy body surrounding the urethra was included with it in order to preserve the vitality of the latter. A perforation was then made with a straight narrow bistoury through the body of the penis from the wound to the glans. This perforation was made in the form of a crucial incision, so as to avoid constriction of the urethra in the glans and especially at the meatus. The urethra was then drawn by the aid of a fine forceps through the new canal. Four sutures were then employed to fix the cutaneous collarette to the margins of the new balanic orifice. The wound in the body of the penis was then closed by sutures.

Ligation of the Common Carotid.—FOURMESTREUX (*Arch. gén. de chir.*, 1907, i, 515) says that death from ligation of the common carotid artery usually results from cerebral complications. These may develop immediately or may come on slowly, the latter being much the more common. Among these the hemiplegia never appeared suddenly, as from an embolus. In all the cases observed by Fourmestreux that were followed by autopsy, there was found an ascending thrombosis, beginning at the point of ligation and extending more or less into the region of the cerebral arteries. He found that only septic ligatures give constant origin to an obliterating thrombus up to the first collateral branch. Aseptic ligatures were followed by healing by first intention of the tunics divided by the ligature. In these cases a thrombus practically does not exist. The septic origin of cerebral complications will explain the great diminution in their frequency in recent years. The prognosis of ligation of the primitive carotid depends chiefly upon the nature of the affection which requires it. When done for wounds the mortality was 54 per cent.; for exophthalmos, 7 per cent.; the mortality for all cases between 1900 and 1906 was 21 per cent. The cerebral softening and occular lesions are the direct results of the ascending thrombosis. Blood stasis alone, when the arterial walls are sound, does not determine a thrombosis extending to the cerebral arteries. Infection alone, even though slight, is the cause. This is shown by the diminution of their frequency with the development of aseptic technique, the time of their appearance, usually, from the second to the fourth day, their rarity when the operation is simple and rapid, as for exophthalmos or aneurysm, and their frequency when it is prolonged and complicated, as in the removal of a tumor. At autopsy a coincidence was established between ascending thrombosis and suppurative lesions, local or at a distance; and experiments demonstrated that thrombosis developed when infected ligatures were used, and that it was absent when aseptic ligatures were employed.

Lateral Abdominal Herniæ (Pseudoherniæ).—Von Baracz (*Archiv f. klin. Chir.*, 1908, lxxxv, 283) says that lateral abdominal herniæ occupy a special place among the abdominal herniæ. They include those occurring between the costal margin and the ilium, on the one hand, and between the anterior and posterior axillary lines on the other, that is, in the region of the lateral abdominal muscles. They owe their origin either to congenital defects of the oblique muscles or to a partial paralysis of the same muscles from an existing acute anterior poliomyelitis. They are not true herniæ, but pseudoherniæ. They have a broad base, and the hernial rings are not sharply defined on all sides. Usually, the anterior and posterior boundaries are the more sharply marked. Acute anterior poliomyelitis, with resulting paresis and atrophy of a larger or smaller area of the lateral abdominal muscles, is the most frequent, probably the only cause, of the development of the pseudoherniæ. According to the area of the distribution of the primary lesion in the gray substance of the anterior horn of the spinal cord is the area of the paralysis of the abdominal muscles with the associated paralysis of the corresponding lower extremity, or both extremities and the back muscles of the same side. When both lower extremities are paralyzed, usually the one corresponding to the one on which the abdominal muscles are involved is the more paralyzed, or may be totally paralyzed, the opposite extremity being less involved. It is a demonstrated fact that a more diffuse paralysis of the abdominal muscles in the beginning becomes more restricted after the course of several years. The recti muscles are many times involved in the paralysis, but they are stronger than the oblique and offer a stronger resistance to the internal abdominal pressure, and therefore do not take part in the herniæ. Double-sided pseudoherniæ occur, but are rare. More attention should be paid to acute diseases in children, and in every case a careful neurological (electrical) examination should be made. The surgical treatment of these herniæ is almost out of the question. Only in very small, high, lateral, muscular defects should an attempt be made by plastic operation to overcome it. Proper support by bandage and proper treatment of the associated paralysis are indicated.

Primary Otogenous Thrombosis of the Bulb of the Internal Jugular Vein.—Grossman (*Archiv f. klin. Chir.*, 1908, lxxxv, 63) says that primary thrombosis of the bulb of the jugular vein is only relatively rare. Of from 4 to 6 cases of otogenous pyemia, at least one is the result of this cause. Contrary to the view of Leutert and Grunert, a contact thrombosis is more frequent than one from embolus, which, strictly speaking, produces not a primary but an abruptly progressing thrombosis. Peribulbar abscess is many times the cause, many times the sequel of a bulbar thrombosis. It may by contact with the vein become the cause of a thrombus, or, on the other hand, it may result from a thrombus, caused by an embolus. A primary, parietal thrombus can only be diagnosticated as a probability. To support the diagnosis the sound ear should be examined, for comparison. In this way the detection of a bluish, dark shadow in the lower, posterior quadrant of the tympanic membrane is more readily accomplished. The history also is to be carefully taken, since the discovery of a bulbar thrombosis in a parent or in other children of the family aids in the diagnosis.

In secondary bulbar thrombosis, after the removal of the infectious thrombus from the sigmoid sinus, one often sees healing occur with or without ligation of the internal jugular vein. This occurs generally without disturbing the thrombus in the bulb, or without anything else than irrigation of the bulb from the opened sinus or opened jugular vein. In primary thrombosis, however, and when the fever continues high in case of acute, particularly in a subacute, rarely in a chronic, suppurative middle ear disease, unless, after an exploratory exposure of the sigmoid sinus an extra sinus abscess or a parietal thrombus has been found, with no meningitis or other disease of the body, as typhoid, tuberculosis, etc., one should not delay thorough operation, lest pyemic metastases develop. If one waits until the bulbar thrombosis extends upward to the sigmoid sinus and the products of decomposition break through the wall of the sinus, or until the thrombus extends downward into the jugular vein, cases will be lost which could have been saved through operation on the bulb. Indeed, the simple opening of an extension abscess into the neck has sufficed to bring about the healing of a primary bulbar thrombosis. Yet this, like the healing which has followed the simple ligation of the jugular vein, is a pure accident. In parietal thrombosis of the bulb, one should at least undertake as early as possible the ligation of the jugular vein and the opening of the sigmoid sinus in the region of the inferior knee. The first change of the tampon applied for hemostasis allows the escape of the decomposed products of the bulbar thrombosis and decreases the danger of a thrombosis of the inferior petrosal sinus and of a later fatal cavernous thrombosis. For parietal as well as obstructing thrombosis of the bulb, the treatment is to expose freely and clean out the bulb itself after a preliminary ligation of the jugular vein.

THERAPEUTICS.

UNDER THE CHARGE OF

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Potatoes in Diabetes.—LABBE (*Presse méd.*, 1907, lxxxii, 649) has shown that the starch of potatoes is better borne by diabetics than that of other carbohydrate foods, and especially that it is preferable to that of bread. The potato is better tolerated than milk sugar, and it has distinct advantages over oat flour and the leguminous vegetables. Potatoes contain two and one-half to three times less carbohydrate matter than bread, and they may be employed to the exclusion of the latter. The patient may easily be brought to content himself with one potato, containing from 300 to 600 grains, at each meal. It will usually be found easier to cut out bread entirely from the diet than to diminish its amount, and the substitution of potatoes for it is generally acceptable to the patient. An additional advantage possessed by the potato diet is that it increases the tolerance for and absorption of fatty foods. Labbe does not contend that the potato diet has any specific or curative action, and he holds that in diabetic diet the quality of the carbohydrates taken should be regulated rather than their quantity.

Aspirin in Asthma and Emphysema.—BADER (*Klin. therap. Woch.*, 1907, xiv, 1291) considers that aspirin, in addition to its usefulness in rheumatic and kindred conditions, has a distinct field in bronchial asthma and emphysema, and reports a series of cases to bear out his assertions. In 3 of these the results have been markedly good, and in about 20 others the administration of aspirin has been followed by improvement. In some few instances a tendency to collapse has been noted as occurring as a result of the medication, and to prevent this Bader advises that caffeine sodiobenzoate be combined with the aspirin, which may be given in daily quantity of 60 to 75 grains in divided doses of 7½ to 15 grains each.

The Therapeutic Action of Sodium Cacodylate—DAWES and JACKSON (*Albany Medical Annals*, 1908, xxix, 139) report results in 45 patients suffering from different ailments, such as lichen ruber, eczema, psoriasis, simple anemia, splenic anemia, pernicious anemia, Hodgkin's disease, chorea, malaria with gastralgia, and various neuroses. Of these, 34 were either entirely cured or much benefited, 11 were unimproved, and 2 were apparently made worse. Their most striking result was in a patient suffering from lichen ruber with anemia. This patient received 2¼ grains of sodium cacodylate daily for six days, when the dose was doubled. Six days later the dose was increased to 6¾ grains, and six days later to 9 grains. This dosage was continued for thirty-four days, when it was reduced to 4½ grains. Four weeks later it was reduced to 2¼ grains, and about a month later to ¾ grain every other day for three weeks, when it was omitted for ten days and then resumed for three weeks more every other day. A distinct cure followed. The technique of the treatment is as follows: The sterile solution of the sodium cacodylate is made and each dose is enclosed in a gelatin capsule, which at the time of administration is emptied into a hypodermic syringe, which is then filled with boiling water. The injection is given, while still warm, through a long needle and under thorough asepsis, deeply into the gluteal region. A sense of exhiliartion is often noted as taking place soon after the injection. The treatment is almost always followed by a distinct gain in weight, and the rapidity of improvement seems to depend much upon the size of the dose, being slow with small doses and quick with large ones.

Ipecacuanha in Amœbic Dysentery.—Raymond (*Military Surgeon*, 1908, xii, 46) writes enthusiastically concerning the use of ipecacuanha in amœbic dysentery. He gives full details of his treatment, which, in addition to rest in bed, preliminary opening of the bowels by a saline, fluid diet, and general careful nursing, consists in the administration of 30 drops of tincture of opium followed in twenty minutes by 6 gelatin capsules, each containing 5 grains of ipecacuanha. These should be swallowed with as little water as possible, and the patient is enjoined to lie perfectly still, and an ice-bag is applied to the throat. If the advised precautions are carried out, no emesis is likely to ensue. The ipecac is repeated on the following day and the next, and then all medication is stopped except the administration of 15 grains of ipecac, preceded by 20 drops of tincture of opium, each evening for the next four days. The ipecac is diminished then to 5 grains for two or three days, when the amœbæ may be considered to be eliminated from the system and the process of repair inaugurated.

Alcohol in Gastric Diseases.—Salisbury (*Journal of Inebriety*, 1907, xxix, 289) concludes a consideration of this subject as follows: (1) No harm can come from the exclusion of alcohol from the diet of normal men, nor of those afflicted with gastric disease. (2) The amount of alcohol which may be taken without harm is undetermined, but probably does not exceed 3.75 drams daily. (3) There is no reason why this amount should be decreased on account of a special injurious action on the stomach, but it is possible that the continuous use of small amounts may produce injurious effects. (4) Alcohol increases the acidity but not the pepsin of the gastric juice, favors motility and absorption, and is itself readily absorbed. In moderate amount it causes no significant retardation of digestion, but its continued use in large quantities produces hyperchlorhydria, acid gastritis, mucous catarrh, and final destruction of the gastric glands. (5) Alcoholics are objectionable in stomach disease on account of constituents other than ethyl alcohol, fusel oil, tannin, yeasts, etc. (6) Alcohol is contra-indicated in ulcer, hyperacidity, and catarrhs in which it has been a causative factor. It is of doubtful propriety in neuroses, on account of the possibility of habit formation. (7) Alcoholics may be used, under restrictions, as a stimulant to the appetite, but their continued employment tends to lessen the response of the gastric mucosa to the normal stimulus of food. (8) The use of alcohol to relieve gastric distress is rational, but it should be employed only temporarily. (9) The use of alcohol to counteract the irregular distribution of blood in consequence of vasomotor disturbances is rational, but requires further investigation.

Potassium Iodide in Mental Diseases.—WALKER (*New York Med. Jour.*, 1908, lxxxvii, 19) reports eleven instances, some of them syphilitic, of mental disease in which potassum iodide in massive doses has exerted a pronounced effect. He considers that it is impossible to give enormous doses of this drug unless the patient is on a full diet and the iodide is given directly after meals. He employs the saturated solution in water or given in milk, and has yet to find an individual who is unable to take the drug in very large doses. In most patients a "primary eruption," situated chiefly on the chest and face, is noted; slight nausea also may occur, both these symptoms, however, disappear upon increase of dosage. In a good percentage of cerebral syphilis, if treatment is begun within three months after mental impairment is noticed, the patient will regain his normal faculties. Some difficulty may occur in getting the dose above 300 or 400 grains, but only when it is impossible to get the patient to eat heartily, and Walker has a number of patients who, after passing out of his hands, have been taking 60 grains of the drug three times daily for months without deleterious effect.

Vaccine Therapy in Bacterial Diseases.—FLOYD and WORTHINGTON (*Boston Med. and Surg. Jour.*, 1908, clviii, 5) conclude a paper on this subject with the following statements: (1) Each new method in medicine should have a thorough trial before it is rejected. (2) A non-attenuated specific vaccine, given in proper dose, is essential to success in vaccine therapeutics. (3) To control the amount and frequency of the dose of a vaccine, either the opsonic index or the general clinical symptoms may be the guide. (4) Localized infections of moderate duration offer the best field for treatment. (5) The vaccine treatment, when used in conjunction with medicine and surgery, may lessen suffering and deformity and frequently save life.

Stock Vaccines versus Autogenous Vaccines in Therapeutics.—BEEBE and MEDALIA (*Boston Med. and Surg. Jour.*, 1908, clviii, 37) state that the question whether a stock or an autogenous vaccine should be used varies with the individual patient. Whenever possible they are accustomed to use an autogenous vaccine. In affections of long duration, however, it has been observed that at times an autogenous vaccine no longer produces good results, for the reason that the patient has become tolerant to it. This tolerance may be due to the fact that the dose is too small, or that there are too frequent injections in one spot, or that the vaccine has too little virulence. When cultures show a growth of Staphylococcus pyogenes albus, or a weak Staphylococcus pyogenes aureus, a stock vaccine made from five or six virulent strains of Staphylococcus pyogenes aureus often gives better results. In more acute and virulent infections, other than staphylococcic, autogenous vaccines have proved very satisfactory.

The High-frequency Current in Hemorrhoids.—Imbert (*Marseilles médical*, xliv, 581) has found the high-frequency current useful in hemorrhoids accompanied by bleeding. This treatment is especially indicated in aged patients in whom an operation might be followed by untoward consequences. After the first application the hemorrhage ceases and does not reappear, the current appearing to cause a distinct diminution of the congestion and to exert a remarkable analgesic effect, the pain ceasing under its influence and the contraction of the sphincter being relieved.

Urotropin and Albuminuria.—Langheld (*The Therapist,* 1907, xvii, 133) concludes a study of the effect of urotropin in producing albuminuria with the following statements: Urotropin, even in large doses, does not cause an excretion of albumin in healthy individuals; on the other hand, small doses are followed by albuminuria if hereditary taint, such as degeneracy, or acquired weakness exists. The cause is always some neurotic degeneration in the sympathetic nerves and may be threefold, either (*a*) the existing regulating factors perform their function at intervals, but fail to do so in case of any increased irritation, or (*b*) the neurotic function has at some previous time been affected and regenerated only so far that even a very slight new insult is sufficient to cause it to fail, or (*c*) an interruption in the function does not exist as far as demonstration goes nor has any insult occurred in the region of the renal function; there exists, however, a general disturbance in the nutrition and function of the nerves which needs but a slight additional burden (through urotropin) to make its appearance. It is assumed that within the kidneys there are sympathetic nerve fibers which, under the above-mentioned hypotheses of morbidity would be affected by passing formaldehyde to such an extent that they either contract or harden, and thus allow the albumin to pass or to form.

The Roentgen-rays in Sarcoma.—Pfahler (*New York Med. Jour.*, 1907, lxxxvi, 1153) states that the Röntgen-ray treatment of sarcoma has in the past been confined to inoperable and rapidly recurring types of this tumor; in other words, it has been practically confined to the treatment of hopeless cases, and therefore the results obtained are marvellous. This form of treatment can be recommended in all inoperable cases, but the more extensive the disease the less likely are we to obtain a complete recovery. In cases suitable for operation the rays should be used before and after operation. In each instance there should be a consultation between the surgeon and the Röntgenologist. The freedom from recurrence is surely greater than that obtained from any other form of treatment in the same class of hopeless types of sarcoma. Some of these patients have remained well for from three to four years after cessation of treatment. Finally much will depend on careful technique and skilful application of the rays.

PEDIATRICS.

UNDER THE CHARGE OF
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The Caloric Value of Modified Milk in its Relation to Infant Feeding.—LADD (*Archives of Pediatrics*, 1908, xxv, 178) carefully fed 20 infants upon accurate modifications of milk, the caloric values of which could be closely estimated. Most of the infants, when first seen, were underdeveloped and subject to varying degrees of gastric and intestinal indigestion. He draws the following conclusions from his investigation: (1) The calories in the food of an infant in the first year of life cannot be furnished by the fats, sugar, and proteids vicariously, if the best results of substitute feeding are to be obtained. (2) The number of calories required increases in each quarter of the year. In this series of 20 cases the average number of calories ingested each day for the four periods was 483, 666, 860, and 1018, while the corresponding energy quotients were 116, 126, 125, 120. (3) A given number of calories per day does not necessarily cause the same rate of growth in infants, even if they are of the same age and development. (4) A food of a given energy quotient does not necessarily cause the same rate of growth in infants, even if they are of the same age and development. (5) The caloric value of the food, expressed either in terms of the number of calories ingested daily or as the energy quotient, is not the most important consideration in determining the quality of an infant's food. The nutrition of an infant depends primarily upon its power to digest and assimilate milk. These functions are best served by modifying the percentages of the constituents of milk so as to adapt the food to the individual needs of the infant. In a given case, neither the number of calories nor the energy quotient of the food can be positively determined by rule, but, like the fats, sugar, and proteid in percentage feeding, must be ascertained by experiment. The calculations of calories and energy quotients in connection with percentage feeding can be easily made, but they add nothing in the way of information which cannot be obtained by careful observation of the gastric and intestinal functions and the weekly gain in weight.

Kernig's Sign in Infancy: A Study of 2000 Cases.—Kernig's sign consists in the inability to extend the leg fully on the thigh when the thigh is at right angle with the trunk, or to flex the thigh to a right angle when the leg is extended on the thigh. The sign is not positive unless the angle is 135 degrees or less; it is an involuntary manifestation and not accompanied by pain, as is the case in sciatica, in which the unwillingness is voluntary and due to pain. J. L. MORSE (*Archives of Pediatrics*, 1908, xxv, 167) examined 2000 infants under two years of age, afflicted with a large variety of diseases, to determine the value of the sign in different conditions. Of 507 normal babies, not one of them showed

Kernig's sign. Of 85 pneumonia patients, only 2 had the sign; neither of the two had meningitis. Concerning meningitis, his conclusions are: Kernig's sign is almost never found in infancy, either in health or disease, except in meningitis. It is found so rarely in other diseases at this age, that its presence in an acute case justifies, so far as any one sign can, the diagnosis of meningitis. It is never present in some cases, however, and in many others it is present only intermittently. It occurs with equal frequency in all stages of the disease. It has no apparent connection with the degree of intracranial pressure. It is more often present when the knee-jerk is increased than when it is diminished. It is of no value in the diagnosis between the tuberculous and the cerebrospinal forms.

Acute Hemorrhagic Nephritis following Epidemic Parotitis in a Seven Months' Old Child.—Jelsky, of Danzig (*Archiv f. Kinderh.*, 1908, xlviii, 164), reports the following fatal case of mumps: A boy, aged seven months, shortly after he had recovered from bronchopneumonia, developed an attack of mumps. Three others in the family had previously suffered from the same disease. The process consisted of a marked swelling of the parotid gland on the right side, increased flow of saliva, and slight fever. After nine days the child had sufficiently recovered to be sent to the street on a hot day. Two days later the condition recurred and the skin over the lachrymal region was reddened. The temperature rose to 104°, and the diapers showed a reddish stain, which was found to be due to hemorrhagic urine. The urine contained blood, albumin, and blood casts. The submaxillary gland became affected later, and the child died with uremic symptoms. Bacteriological examinations of the urine and saliva revealed a number of organisms, but none of them proved to be pathogenic in animal experiments. Of the other three children in the same family affected, the first had the lightest attack, the second was more seriously ill, and the third still more so.

Treatment of Prolapse of the Infantile Rectum by Stiffening with Paraffin in Longitudinal Strips.—After discussing the pathology, etiology, and treatment of prolapse of the rectum in children, N. A. Kephallinos (*Jahrb. f. Kinderh.*, 1908, lxvii, 325) describes a method of treatment which has been employed by Spitzy, of Graz, in 32 cases. The prolapse is reduced, the rectum evacuated and thoroughly cleansed, and the neighborhood of the anus carefully disinfected. The armamentarium consists of a syringe with a capacity of 5 c.c., covered with a soft rubber mantle to prevent the rapid cooling off of the paraffin, and a cannula needle 10 cm. long; paraffin with a melting point of 45° to 50° is used and kept ready in a water bath at a temperature of 60° to 65°; also sterilized water at the same temperature. After the child is etherized, the warmed syringe is filled with paraffin, one-eighth of which is then ejected and in its place hot water sucked up; the cannula, which cools off more quickly than the syringe, is thus filled with hot water and kept warm. The left forefinger is inserted into the rectum and the cannula made to perforate the skin 1 cm. to the outer and posterior part of the rectum; it is pushed into the pararectal tissue to as high a point as is possible parallel with the rectum; the inserted finger acts as a guide to the needle. Care must be taken not to perforate the rectal mucosa. The paraffin is then injected as the syringe is withdrawn. The same procedure is repeated on the opposite side, thus supporting the rectum with two longitudinal rods of paraffin. The injection must be made quickly and with the same amount of force all along the line; when the syringe is within 1 cm. of the anal skin, the injecting must cease, or a paraffin clot will close the skin wound. A plaster dressing is then applied and the child kept in bed two days. Of the 32 cases, 31 were cured, and in no instance was embolism observed.

Bacteriological Examination of a Case of Noma.—After discussing at some length the literature of the bacteriological findings in noma, HELLESEN (*Jahrb. f. Kinderh.*, 1908, lxvii, 294) reports the case of a boy, aged three years, who had passed through measles several months before the present illness, and had recovered perfectly. Two weeks before he came under observation he began to complain of pain in his right ear, but had no discharge. He recovered from this, and nothing abnormal was noted until four days before his admission, when the right cheek became painful and showed some swelling; this increased in spite of local treatment, and became gangrenous within a few days. The gangrene began on the inner side of the cheek, and was associated with œdema and infiltration of the cutaneous surface; the process spread continuously until within a few days before death, which occurred three weeks after the disease commenced. Marked anemia developed in the course of the process. Hellesen made a series of examinations, and succeeded in isolating a diplococcus, which he found constantly in the sections of the diseased tissue; other bacteria were found as well, but none in as large numbers as the diplococcus mentioned. They were also found in the neighboring round-cell infiltration and the surrounding apparently healthy tissue. They were found in the blood of the patient during life and after death, and could be isolated in pure culture. A specific necrosis was produced by them in animal experiments, and the organisms could be recovered from the blood and the necrotic tissue of the animals. The nomatous tissue and the isolated diplococci were experimented with. Hellesen concludes that the diplococcus in question was the cause of the case of noma he studied. He is not willing to draw any conclusions for noma in general, however, from this one case, but states expressly that no Klebs-Loeffler organisms were present.

OBSTETRICS.

UNDER THE CHARGE OF

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Three Cesarean Sections for Unusual Indications.—SEIFFART (*Zent. f. Gyn.*, 1907, Nr. 31) reports the case of a Cesarean section for eclampsia in a primipara at eight months; the cervix was not dilated and the patient seemed excessively ill. She was placed in a motor car and taken rapidly to a hospital, where Cesarean section was performed. Mother and child made a good recovery. His second case was also one of eclampsia and was treated in a similar manner, with recovery of mother and child. The third case was that of a girl, aged fourteen years, who was suffering from very great œdema of the lower extremities and genital organs. There were no labor pains, and heart sounds could not be heard. This patient was taken in a motor car to the hospital as soon as possible, the child delivered by Cesarean section. The child was born asphyxiated and revived and mother and child made a good recovery.

A Method of Introducing Air into the Mouth of a Child Born in Breech Presentation.—Ruhl (*Zent. f. Gyn.*, 1907, Nr. 31) believes that much can be done to save the lives of children born in breech presentation by introducing air into the mouth of a child while the head is on the pelvic floor. In one of his cases he incised the cervix freely with blunt-pointed scissors, and introduced the hand in such a manner as to open the cervix with the fingers, admitting air. He also describes the use of an instrument shaped like the blade of a forceps, for the same purpose.

Scopolamine-Morphine Anesthesia During Labor.—Newell (*Surg., Gynec., and Obst.*, August, 1907) gives the results of the use of scopolamine-morphine in 123 cases. A solution containing $\frac{1}{10}$ grain of Merck's scopolamine-hydrobromide and $2\frac{1}{2}$ grains of morphine sulphate was prepared at least every fourth day unless needed more often. When uterine contractions occurred every five minutes the patient was given $\frac{1}{150}$ grain of scopolamine and $\frac{1}{6}$ grain of morphine hypodermically. At the end of one to two hours this dose was repeated unless the patient was promptly influenced by the first dose; when this was the case the second dose was not given until the effects of the first dose began to disappear. The dose was not repeated if the cervix was dilated two-thirds, to avoid the continuous action of the drug after labor. The drug produced a definite result, the majority of patients becoming drowsy or sleeping between the pains. It was found that when a fresh solution was used all the patients reacted to the drug. The suffering of labor was much less, in some cases being entirely removed. Patients did not remember to have endured pain in most cases; labor was shorter as well as easier; the necessity for interference was less. Hemorrhage was not more frequent than in other cases, nor a tendency to bleeding; occasionally relaxation of the uterus developed. Upon the heart, respiration, and pulse no bad effects could be observed. Of the 123 cases 17 had practically no pain during labor; 70 had little discomfort; 19 slept lightly during the pains, but had distinct pain when the uterus contracted; in these cases the patient slept between the contractions, but had definite and severe pain when the contractions occurred. In 11 cases the drug produced no effect. Thus, in 112 out of 123 cases labor was made distinctly less painful and more easy by this method. In 71 primiparæ labor averaged fifteen hours in duration. In 51 primiparæ in whom the dilatation varied from two inches to a finger-tip the child was born, in 20 cases, within four hours after admission. In 10 other cases dilatation was complete in this time. In 14 patients operation was necessary; 1 had eclampsia; 1 prolapsed cord; 1 high arrest of the breech in a contracted pelvis; in 1 a high application of forceps. The low forceps operation was done ten times. This would seem to indicate that by relieving the pains of the first stage of labor more vigorous contractions developed during the second. The quantity of blood lost after delivery seemed to be less rather than more in these cases and the uterus contracted well. In 90 per cent. the results of the treatment were satisfactory.

Pubiotomy in America.—Fry (*Surg., Gynec., and Obst.*, August, 1907) reports two pubiotomies and gives a summary of the results obtained by American operations to date. His first case was that of a multipara, who had previously been delivered with great difficulty by a high application of axis-traction forceps; in the second labor efforts were again made with forceps, but proved unsuccessful. The external conjugate measured 17.5 cm., the true conjugate 8.5 cm. The urine obtained by catheter was bloody. Cesarean section was declined because of previous efforts at delivery and from the fact that the patient was probably infected. Incision was made a little to the left side of the median line of the pubes, and the Gigli saw was attached to a ligature and drawn through. The bone was severed about 1 cm. to the left of the joint. The child was easily delivered by forceps, the ends of the bones separating about 5 cm. There was moderate hemorrhage easily controlled, and a transverse tear on the left side at the attachment of the anterior vaginal wall. This was closed with catgut, and healed without infection. Hemorrhage occurred from the uterus, which was controlled by hot sterile douche and gauze packing. The patient's recovery was complicated by a temperature of about 102° F. and foul lochia for the first week. The pelvis was encircled by a broad strip of adhesive plaster and an abdominal binder and sand-bags were placed at the sides. The patient was convalescent in about four weeks after the operation. Ten weeks after operation bony union was found to be good without callus. The patient could walk without pain and go up stairs without difficulty. The child weighed ten and a half pounds; the anterior fontanelle was almost closed and the various diameters of the head were large. The child died on the fifth day, and autopsy revealed two fractures of the occipital bone and a blood clot at the base of the brain.

The second case was that of a primipara in whom a high application of forceps failed to deliver. The pelvis was flattened, with true conjugate 8.5 cm. The head was transversely at the pelvic brim. The perineum had been torn and the vulva was badly bruised. The patient was very fat and the surroundings very unfavorable for asepsis. Pubiotomy was readily performed and the child delivered by forceps. The bones separated about 4 cm., with very little hemorrhage. Two chromicized catgut sutures were used to close the periosteum; the pelvis was immobilized as before. In addition a heavy canvas belt was doubled about the pelvis. The patient was annoyed by distention of the abdomen and had fever for the first week, followed by phlebitis of the left leg. She did well, however, until the tenth day, when she was turned upon her side; this was followed by cardiac embolism and death twelve hours after. The child was practically stillborn and badly bruised by the forceps.

Fry collected from the work of American operators 20 pubiotomies, of which 12 were primary and 8 secondary. The maternal mortality was 20 per cent., none in the primary operation, which makes the mortality 50 per cent. for the secondary. The causes of death were shock the second day; sepsis on the fifth; heart embolism on the eleventh; pulmonary embolism forty-two days after operation. 40 per cent. of the infants died during the first week. Laceration of the anterior vaginal wall occurred in 7 cases; this was repaired and healed without complications. The child was readily delivered in all the cases, the average separation of the bones being about 4 cm. There was postpartum hemorrhage in 2 cases.

All the patients had rise of temperature during the puerperal period, ranging from 99.8° to 102.4° F. Septic phlebitis developed in 5 cases; hematoma and œdema of the vulva in 5 also. In all good bony union occurred, and all patients walked well except 1. There was no callus of the posterior portion of the bone in any of the cases; but 1 on the anterior surface and at both sacro-iliac joints.

When the child is living and Cesarean section is contra-indicated, a moderate degree of pelvic contraction justifies the performance of the operation.

Spontaneous Rupture of the Cervix in Abortion.—BLUMREICH (*Zent. f. Gyn.*, No. 29, 1907) saw a very unusual case of a primigravida, in whom it was necessary to terminate an early pregnancy. Iodoform gauze was introduced into the cervix, followed by the development of considerable pain. The temperature rose also; the pulse increased in frequency; the uterus became very sensitive and there was a fetid mucous discharge. To hasten the emptying of the uterus, tents and bougies were used. This was followed by increase in pain. Twenty-four hours afterward, examination showed that the cervix had not dilated, but had ruptured above the external os. It was necessary to empty the uterus completely under anesthesia and to remove portions of the cervix which had already been torn. The patient recovered, the tears healing by granulation.

GYNECOLOGY.

UNDER THE CHARGE OF

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Internal Hemorrhages after Bilateral Castration.—BACHELLERIE (*Thèse de Bordeaux*, 1907) states that the uterine hemorrhages that follow bilateral castration do not resemble menstruation, either in periodicity, amount, or duration. If the flow is regular, presumably ovarian tissue has been left behind. In most cases the hemorrhages are due to the lesions of pelvic cellulitis reacting upon some morbid condition of the adnexa and surrounding tissues. The acute exacerbations of such pelvic cellulitis by reflex action cause uterine congestion and a flow of blood contemporaneous with the inflammation. The influence of the menstrual habit is conceded. The approach of the period of former menstruation disposes to uterine congestion and hemorrhage. The class of uterine hemorrhages under consideration demands a careful examination of the pelvic cavity to ascertain the characteristics of the cellulitis in each individual instance.

Primary Epithelioma of the Vagina.—Trapenard (*Thèse de Paris*, 1907) declares this disease occurs most frequently between the ages of thirty and fifty years, and that it seems absolutely unmodified by heredity or pregnancy. Nor have congenital anomalies, parasites, or irritations been found to be influential in its development. Trapenard recognizes it may be tubular or cylindrical, and histologically it may be papillary or interstitial. It develops rapidly, and always extends through the lymphatics. It is likely to recur in every case.

The Shape of the Labia Minora during Menstrual Life.—Jayle (*Rev. de gyn. et de chir. abdom.*, May, June, 1907) has examined 500 women during menstrual life with a view to determining this point, and concludes: (1) The labia minora in most cases project between the labia majora; (2) the preputium clitoridis is not anatomically an offshoot of the labia minora; (3) the labia minora may enclose only the anterior part of the vaginal orifice, or may surround it completely; (4) there may be a paranymphal fold between the labia minora and majora; (5) separate commisural folds may exist at the posterior part of the vaginal orifice; and (6) the fourchette may be formed by the posterior commissure of the labia minora, by a prolongation of the paranymphal folds, or by a separate commissural fold.

Origin of the Hymen, Vagina, and Urethra.—Retterer (*Rev. de gyn. et de chir. abdom.*, May, June, 1907), after a rather extensive study of the development of the hymen, vagina, and urethra in various mammals, by means of serial sections of the embryos and fœtuses, concludes that the structures are not developed from the Müllerian ducts, but from the urogenital sinus. Retterer states the urogenital sinus is divided by projections from the lateral walls which form the septum between the urethra and vagina. The anterior tube thus formed becomes the lower part of the urethra, and the posterior tube becomes the vagina. The upper part of the urethra is formed from the pedicle of the anterior tube which becomes the lower part of the urethra and the posterior tube. The hymen is developed from two folds of the posterolateral walls of the urogenital sinus, and is vestibular and not vaginal in origin.

A New Flap Operation for Vesicovaginal Fistula.—L. Moszkowicz (*Zent. f. Gynäk.*, 1908, xxxii, 65) makes two flaps, both of which are left attached at the margin of the fistula. The first flap consists of vaginal mucosa, and is made larger than the opening to be closed. The second flap is about the size of the opening, and is made preferably from the bladder mucosa, but may also be made from the vaginal mucosa. The vaginal flap is turned into the bladder, the epithelium facing the interior of the bladder, while the flap of bladder mucosa is turned in like manner into the vagina. The first flap, being larger than the fistulous opening, naturally overlaps its edges, and with the contents of the bladder pressing against it acts as a valve. The two flaps are sewed together with catgut. Moszkowicz reports one case in which this method was used with satisfactory results.

The Supports of the Pelvic Viscera.—W. E. Fothergill (*Jour. Obst. and Gyn. Brit. Empire*, 1908, xiii, 18) carefully treats this subject and suggests as follows: (1) The so-called ligaments of the uterus lie loosely upon the subjacent structures, and have no supporting action. The broad ligament is simply a mesovarium and mesosalpinx. The uterosacral and uterovesical folds are incapable of resisting downward pressure, as is the round ligament, which, moreover, is a vestigial structure (gubernaculum ovarii et uteri). (2) The external muscular layer of the pelvic floor has a sphincteric rather than a supporting action. (3) The internal muscular layer of the pelvic floor, being the degenerated representative of the tail muscles of lower animals, has largely lost its muscular action; and the lower part of the levator ani merely acts as an adjuvant to the sphincters of the recum and the sphincter vaginæ. (4) The classical descriptions of the pelvic fascia should be given up, and the fascia should be regarded as the sheaths of the muscles, the vessels, and the viscera. (5) The internal muscular layer, with its fascial investment, forms the funnel-shaped pelvic diaphragm. (6) The pelvic diaphragm does not support the pelvic organs by its muscular action. (7) The pelvic diaphragm could not support the pelvic organs in virtue of its shape, were they not firmly attached to its sloping lateral walls. (8) This attachment is accomplished by the fibrous sheaths of the bloodvessels and accompanying structures which supply the pelvic viscera. The one constant essential cause of prolapse is relaxation of the perivascular sheaths. (9) The rectum has attachments to the back of the pelvis quite distinct from those of the urinogenital organs to its sides. It does not descend with them in prolapsus. When the anterior rectal wall descends in rectocele it is united with the posterior vaginal wall by cicatricial tissue, the result of infection during the healing of perineal tears.

The Treatment of Inoperable Carcinoma of the Uterus with Acetone.—G. Gellhorn (*Münch. med. Woch.*, 1907, liv) has had favorable results in alleviating the distressing symptoms of inoperable carcinoma of the cervix by the local application of acetone. This drug was first used for the purpose of lessening the offensive odor, which it was found capable of destroying almost entirely. It was observed, moreover, that the discharge was materially checked and hemorrhage to a large extent controlled by the acetone treatment. While the method is offered only as a palliative measure capable of relieving the patient either entirely or to a large extent of the most distressing symptoms of the disease, it is considered possible that life may be prolonged in this way.

The treatment is carried out as follows: As much of the growth as possible is removed and 5 to 10 c.c. of acetone is applied directly to the diseased surface through a cylindrical speculum which is held firmly against the growth, the patients pelvis being elevated to facilitate the application. The acetone is allowed to remain in contact with the surface for about thirty minutes, when a strip of gauze is packed into the curetted cavity, thus absorbing the excess of acetone and keeping it in contact with the diseased surface. The pelvis is then lowered and the lower portion of the vagina and the vulva are douched and dried. The gauze is removed in twenty-four hours. The application of acetone is made three times a week or less often, as the case may require.

Tuberculosis of the Neck of the Uterus.—Deletrez (*Ann. de gyn. et d'obst.*, 1908, xxvi, 34) reports a case of this rare condition operated on by him, and exhibits four illustrations of microscopic slides made from tissues removed. The patient was a girl, aged twenty-one years, who, although menstruating regularly, had since the age of fourteen years suffered from profuse leukorrhœa, but had an appearance of excellent health. The cervix was found to be voluminous, and through a speculum presented the appearance of a mushroom fungus entirely similar to cancer of this structure, with even some excavation. The fungosities were seen to be developing from the cervical canal as well as from the vaginal side of the portio vaginalis. An examination of the patient failed to reveal tuberculosis in any other part of the body. Six months after vaginal hysterectomy the patient was in excellent health. The specimen was carefully examined. The uterus had normal dimensions except a part of the cervix, which was thickened and had attached to it numerous cauliflower-like growths. The internal surface of the body had a fibrous appearance and some small disseminated granulations approaching the neck, involved by numerous papillary granulations disseminated on its surface; the section showed a rose-colored tissue having less firm consistency and without apparent delimitation with the uterine tissue. Microscopic examination of various portions of the cervix and uterine body were made, all of which showed inflammatory and tuberculous infiltration, with accumulation of giant cells and small round cells in nodules. The stratified pavement epithelium was invaded with abundantly infiltrated and necrosed areas, and hemorrhagic areas were noticed. Various areas of tuberculous invasion were demonstrable in the mucosa of the body and cervix, nodules being plentiful. No tubercle bacilli were found, nor was the microscopic appearance at all that of epithelioma. He states that the primary variety of tuberculosis of the cervix occurs in a very small percentage of all cases.

Carcinoma of the Vulva.—R. Teller (*Zeit. f. Geb. u. Gyn.*, 1907, lxi, 309) reports 36 cases of carcinoma of the vulva, and discusses the data quite fully. In 16 cases there was a recurrence of the disease, which serves to emphasize the need of thoroughly removing all connecting lymphatic glands.

OPHTHALMOLOGY.

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Ophthalmoplegic Migraine.—DeLapersonne (*La clin. ophtal.*, 1907, No. 6, p. 90) reports a case of ophthalmoplegic migraine remarkable for its long duration. A woman, aged fifty-four years, was affected since the age of seven years with attacks of migraine lasting from one to four days. At first the eye was closed during the attack; from the age of fourteen the attacks occurred every month accompanied by ptosis and crossed diplopia, which persisted some days after the cessation of the pain. At about the age of forty the external strabismus became permanent, the attacks becoming rarer. Sulzer reports a case in which the attack recurred after thirty-three years. Jacques observes that many cases apparently belonging to the type of ophthalmoplegic migraine are actually symptomatic of an anatomical lesion, so that great reserve is necessary in the beginning in the diagnosis.

Paralysis of the Accommodation in Diabetes.—DeLord and Revel (*La clin. ophtal.*, 1907, No. 13, p. 204) observed in a diabetic subject complete bilateral paralysis of the accommodation. It began suddenly and lasted a month, disappearing as suddenly as it came. There were no disturbances of the pupillary reflexes. They ascribe the paralysis to inhibition of the cerebral centre of accommodation.

Congenital Palsy of the Oculomotor Nerve with Continuous Movements of the Pupil.—Levinsohn (*Zeit. f. Augenh.*, 1907, 341) describes the case of a child, aged six years, in whom, while the left eye was normal, the right eye showed almost total paralysis of the oculomotor nerve, with constant variations in the diameter of the pupil, changing from 2 to 9 mm., remaining at it maximum and minimum from ten to twenty seconds. About ten seconds are required for the mydriasis to take place, and but one to five for the transition to myosis. These movements are not influenced by light or convergence. Upon strong abduction the mydriasis occurs somewhat sooner than when the eye is at rest. If the pupil be in its myotic state this can be interrupted or temporarily abolished by abduction of the globe. Strong adduction exerts an even greater influence, the right pupil being stimulated to contraction prolonging the myotic stage or temporarily interrupting the mydriasis. These impulses affecting the pupil are, however, of temporary effect only, never exceeding a minute, so that after a little time the regular changes recur. Of greater influence than the movement of adduction is the contraction of the orbicularis. When the child is asked to close the lids tightly, but is prevented from doing so by their being held apart, contraction of the pupil takes place even if it be in the stage of mydriasis. Coincidently with the myosis spasm of the accommodation 2.5 to 3D uniformly occurs, converting a hypermetropia of 4D during mydriasis to a hypermetropia of 1D during myosis. Five similar but not identical cases have been previosuly described. Levinsohn believes nuclear disease to be the cause of this condition.

Paralysis of the Sixth Pair of Cranial Nerves after Rachistovainization.—Blanluet and Carron (*Ann. d'oculistique*, 1907, p. 62) report a case of paralysis of the left external rectus muscle occurring a week after the operation, preceded and accompanied by pains in the upper part of the back and neck. They have collated 12 additional cases, 11 of which occurred in Germany. In none of the cases was cocaine used alone. In all but one stovaine was used alone or in combination. In a single case adrenalin was employed alone, and in this, the sole instance of the involvement of both externi, the paralysis has persisted. A unilateral abductor was involved in all the cases except the one just referred to. The pathogenesis of these paralyses is not clear. They have been attributed to an elective toxic action, to a localized hemorrhage, and to a mild meningeal infection.

Pseudoptosis with Hysterical Amblyopia following Injury.—Bettremieux (*La clin. ophtal.*, 1907, No. 9, p. 131) reports a case of apparent ptosis with amblyopia of the right eye after an injury followed by litigation for damages. The ptosis and amblyopia were both hysterical. There was anesthesia of the pharynx and almost complete hemianesthesia of the right side, with areas of norml sensibility. Treatment (electricity, hypnotic suggestion, etc.) being of no avail, operative procedures were proposed, but positively rejected by the patient, who thence began to improve spontaneously. Certain medicolegal questions as to damages are raised by a case like this, and which are not unknown in this country also.

PATHOLOGY AND BACTERIOLOGY.

UNDER THE CHARGE OF

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A Review of Anaphylaxis, with Especial Reference to Immunity.—M. J. Rosenau and John F. Anderson (*Jour. Infect. Dis.*, 1908, v, 85) referring to the important condition of hypersusceptibility or supersensitiveness, state that the condition may be brought about by the introduction of any strange proteid into the body. Hypersusceptibility to proteins that are non-poisonous in themselves may be readily induced in certain animals. Immunity and hypersusceptibility may co-exist in one animal at the same time. Von Pirquet advises that the term immunity be limited to indicate the condition of complete resistance in which no clinical reaction occurs when poisons (such as diphtheria or tetanus, etc.) are introduced into the organism. He suggests the term "allergie" to indicate the condition of acquired immunity associated with anaphylaxis, such as vaccine against variola, of the luetic against syphilis, or that produced by an attack of acute specific infection. This condition of "allergie" manifests itself in the renewal of the infection in an entirely different manner from the reaction to the primary infection. Tuberculin reaction is a well-known instance of anaphylaxis. This substance is not poisonous when introduced into a healthy individual, but the tuberculous individual is anaphylactic to tuberculin, and so reacts. Horse serum, egg albumin, and milk all give rise to anaphylaxis in the guinea-pig. The cases of eruptions, joint pains, etc., following the injections of horse's serum into the same individual have given rise when aggravated to the term "serum disease." The effect of the repeated doses of horse's serum in guinea-pigs is most interesting, as even a very minute dose may apparently so sensitize the animals that after a "period of incubation" of from ten to twelve days they may develop very serious and even fatal symptoms if the second injection is then given. Rosenau and Anderson give a careful *resume* of the literature on this subject, and have, as a result of many experiments, strengthened their belief that the phenomenon of hypersusceptibility has a practical significance in the prevention and cure of certain infectious processes. It gives a possible explanation of the period of incubation of some of the communicable diseases. As shown in their work, it takes from ten to fourteen days to sensitize animals to a strange proteid. The phenomenon of hypersusceptibility has been produced in guinea-pigs by extracts obtained from various microörganisms; that produced by the colon and typhoid bacillus was followed by a definite immunity to the corresponding infection, but not in case of the anthrax bacillus. They think, then, that we are, therefore, not dealing with a general law applicable to all infections, but with certain limitations, as in the case of antitoxic immunity.

Experimental Cardiac Arrhythmia.—PLETNEW (*Zeit. f. exp. Path. und Therap.*, 1907, iv, 321) used in his experiments on dogs and rabbits three methods for the production of arrhythmic action of the heart: (1) Electrical stimulation of the spinal cord; (2) elevation of the pressure in the peripheral circulation by allowing salt solution to flow into the femoral and subclavian arteries; and (3) clamping of the aorta. By all these methods the intraventricular pressure was increased, as measured by a manometer, and by each method of experimentation irregularities of the heart were produced. The cardiac arrhythmia was brought about by the appearance of extrasystoles. The irregularity of the heart's action was not always proportionate to the increase in elevation of the intraventricular pressure, and therefore was not entirely dependent upon the extra work put upon the heat. If the peripheral pressure was increased slowly, as occurred in the experiments in which salt solution was forced into the femoral artery, extrasystoles were rarely observed. One of the important factors in producing irregularities appeared to be the rapidity with which the increased pressure was brought about. Sudden clamping of the aorta gave rise to very marked arrhythmia which disappeared after the constriction was removed. In all experiments the reserve force of the individual heart must be taken into account. This varies in different cases. If the obstacle which the heart must overcome does not exceed a certain point, a point which is different for various hearts, the heart has sufficient reserve force to overcome the increased peripheral resistance and the rhythm then remains normal. When the obstruction passes this point the heart's action becomes irregular.

Experimental Tuberculous Cirrhosis of the Liver.—Both French and German investigators have reported, as an accidental finding, cirrhotic changes in the livers of guinea-pigs which had been inoculated with tubercle bacilli, but recently STOERK (*Wien. klin. Woch.*, 1907, xx, 847) has studied systematically the livers from 120 guinea-pigs inoculated with tubercle bacilli, and finds quite constantly definite cirrhotic changes which correspond in a certain way to cirrhosis of the liver in man. In this series of cases the bacilli evidently reached the liver through the portal veins or lymphatics for the earliest changes were found about the intrahepatic branches of the portal vein. These consisted in a proliferation of epithelioid cells and new formation of young connective tissue. At this stage of the process marked proliferation of the liver bile ducts can be seen, with transitions between the bile ducts and columns of liver cells. As the lesions grow older, the picture of a tuberculous infection becomes less characteristic, the proliferation of the portal connective tissue becomes prominent and the new bile duct formation is extensive. Usually the ramifications of the portal vein are narrowed or occluded by the connective-tissue growth and owing to this, foci of necrosis are formed in the liver parenchyma. The necrosis in turn leads to further proliferation of connective tissue. Finally, in the most advanced stages of the process, signs of tuberculous infection have entirely disappeared, and the liver presents an appearance not unlike that seen in portal cirrhosis in man. In contrast to this nodular type of cirrhosis, another form, comparable to the biliary cirrhosis, was met with in which the liver was large and smooth, and showed on section almost complete disappearance of the normal liver cells. The tissue looked as if it were made up of innumerable proliferated bile ducts, about each one of which there was connective tissue. Stoerk is cautious in drawing inferences from these experiments, but thinks that tuberculosis may be numbered among many of the toxic and infectious agents which, reaching the liver by way of the portal vessels, produce cirrhosis of the liver in man.

The Function of the Thyroid and Parathyroid Glands.—Most experimenters who have worked upon the function of the thyroid and parathyroid glands have come to the conclusion that extirpation of the thyroid results in cachexia, while extirpation of the parathyroids is followed by tetany; but certain authors have reported contradictory findings, while by some it has been thought that after extirpation of the thyroid, the parathyroids may acquire the functions of the larger gland. HAGENBACH (*Mit. aus d. Grenzgeb. der Med. und Chir.*, 1907, xviii, 329) in order to settle some of the disputed points undertook a series of experiments upon cats. He found these animals particularly suitable because of the constancy in the number and position of the parathyroid glands, and because of the marked symptoms following thyroidectomy. In six cats varying in age from three to six months Hagenbach removed the entire thyroid gland together with two parathyroid glandules. Two parathyroids were left intact. The animals developed cachexia, and showed many of the conditions typical of cretinism in man. If animals which had developed this cachexia thyreopriva were subjected to a second operation, and deprived of the two remaining parathyroid glands, they died promptly of tetany.

The experiments thus show that the parathyroids are not capable of functionating in cats for the thyroid gland. The study of the long bones of the cats which developed cachexia after thyroidectomy showed interesting changes. The bones were found to be much shorter than those of the control animal, and occasionally somewhat thicker. The shaft and the marrow presented no striking alterations, but sections made through the epiphyses showed an interesting and typical picture. In the normal bone the process of ossification could be seen in regular and rapid progress, whereas in the bones of the operative animals the ossification looked as if it had been checked, and only in places could signs of retarded activity be found. These changes, together with the alteration in the hair of the cats, the size of the abdomen, and general cachexia were most pronounced in the cats operated on at an early age. Hagenbach concludes that the parathyroids and thyroids are to be distinguished anatomically, embryologically, and physiologically as different organs.

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ORIGINAL ARTICLES.

THE USE AND ABUSE OF DIGITALIS.[1]

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Digitalis is an enduring witness of our debt to the early days of therapeutic empiricism. First brought into general use by Withering, in the latter part of the eighteenth century, as a cure for dropsy, it has become, through scientific observation at the bedside and in the laboratory, our mainstay in the treatment of cardiac disease. It is one of the few indispensable drugs. Nevertheless, skepticism as to its value is still frequently expressed. This is about as reasonable as would be distrust of the value of ligatures in surgery. Ligatures may be of poor material, and break, or being wrongly applied, they may slip, but no surgeon would, therefore, think of condemning their use. On the contrary, he would diligently look for the faults in his materials or technique.

It is high time we practitioners of internal medicine took a lesson from the great advances of modern surgery and the success of our surgical colleagues. In our more difficult field, where the sequence from cause to effect is often obscured by intermediate events, we must not make this an excuse for a less rigid criticism of our results, but rather scrutinize both apparent success and seeming failure the more closely, and resolutely improve our technique.

In this paper I purpose to discuss briefly some reasons for failure in digitalis therapy, which I have learned from personal experience, and the equally serious results of certain misconceptions, which make men withhold digitalis when it is urgently needed. The causes for failure in the employment of digitalis, in the order of their frequency and importance, are: (1) The use of inefficient preparations. (2) Use in unsuitable cases. (3) Improper dosage. (4) Improper methods of administration. (5) Neglect of other necessary therapeutic measures.

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[1] Read by invitation at a meeting of the Section on General Medicine of the College of Physicians of Philadelphia, January 13, 1908.

1. Inefficient Preparations. Few practitioners have the remotest idea how little good digitalis can be had. The majority prescribe a drug which, if good, may save life, without inquiry into its character or method of preparation, and often in a form which the least study would convince them must be inert. A surgeon, who should display similar carelessness as to the preparation of his ligatures and dressings, would speedily be brought to his senses by a suit for malpractice. We medical men must face our responsibilities in this matter of dishonesty and incompetence in the drug trade, wholesale and retail, or reap the inevitable harvest of deserved loss of confidence and of our own self-respect.

The active principles of digitalis are glucosides, which decompose readily in the presence of moisture, yielding inert or toxic products. In order that we may be sure of giving efficient digitalis, and not inactive or irritating digitalis decomposition products, the following conditions must be fulfilled: (1) The leaves must be from plants of the second year's growth, picked at the beginning of efflorescence, freed from stalks, and carefully dried. (2) The dried leaves must be kept absolutely dark and free from moisture in sealed tin or glass containers, and for not more than one year. (3) The preparation dispensed must be freshly made from these leaves in exact accordance with the method prescribed by the Dispensatory.

This obviously requires intelligence and honesty of all concerned in each step of the process. A good physician, in the present state of our knowledge, should not concern himself overmuch with pure digitalis glucosides, but should never write a prescription for digitalis without specifying that it is to be freshly made from Allen's English leaves. He should learn from personal investigation which druggists can be trusted to keep good leaves, to keep them dry and dark, and to make a fresh preparation every time it is called for. In New York I can count on a few apothecaries of this kind, and I invariably send patients to them.

The worst digitalis preparation I know is an infusion made by diluting the fluid extract, thus precipitating all of its active ingredients. This is a common practice. Another, of like kind, is an infusion made by diluting a so-called mother liquor. This was once used in a hospital with which I am connected, and digitalis came into bad repute with the staff. Other inefficient forms are the many tablets or pills containing digitalis or digitalin. The only solid form in which digitalis should be given is the freshly powdered leaf in capsule or pill. Since the dose is but one grain, there is no need for a stronger extract. The commercial digitalins are all impure mixtures, made, as a rule, from digitalis seeds, and should only be tolerated where very mild effects are desired over a long period of time.

The use of combinations of heart tonics, usually with nitroglycerin, now sold in tablet form, is one of the most deplorable developments in therapeutics today. The practitioner, who allows himself to give powerful drugs in this way, fails to learn the action of any one of them. If he thinks at all, he becomes a skeptic; otherwise, he remains little more than the agent of some manufacturing pharmacist.

The fluid extract of digitalis, if it really represents the quantity of drug used in its preparation—and this is seriously questioned by Kobert, who claims the digitoxin is lost by precipitation—is far too strong to permit of easy regulation of dosage. I have never happened to see satisfactory results from it, and I do not favor its use.

There remain two official preparations, the infusion and the tincture, besides the powdered leaves, which, under the conditions named above, may be considered trustworthy. The choice of one of these must be largely a personal matter. One should learn how to give a single preparation and regulate its dosage under various conditions. My personal experience leads me, for most purposes, to favor the infusion, chiefly because one can be reasonably sure of having it freshly made if so specified. In case after case supposed to have been treated with digitalis without benefit, I have seen prompt results follow its use. Two cases, out of many I might adduce, should suffice for illustration.

Case I.—A retired merchant, aged fifty-one years, consulted Dr. E. G. Janeway October 3, 1907. He had a history of two severe attacks of acute rheumatism. In July, 1907, he developed dyspnœa; later, albuminuria and swelling of the legs; and a few nights ago, orthopnœa. He was slightly cyanotic, with large jugular veins and systolic venous pulse. His heart was greatly dilated, with harsh mitral systolic murmur; pulse was irregular, 120 per minute; arteries small and soft; arterial pressure, 135 mm. systolic, 100 mm. diastolic. Lungs showed congestion at bases. Liver pulsated markedly, and the edge was four inches below the costal margin. Legs showed some œdema. Urine 1022, with a trace of albumin and fine granular casts. He weighed 171¼ pounds. For some time he had been given digalen, of late taking 6 minims every four hours. He was put on infusion of digitalis, 2 drams every four hours. After a few days his urine began to increase, and October 9 he passed 120 ounces. He then weighed 161¾ pounds; œdema was gone, liver smaller, heart area decidedly diminished (hydropericardium?), and pulse only 88. On November 7 he was free from dyspnœa, weighed 156½ pounds, pulse rate was 75, and arterial pressure 120 mm. systolic, 80 mm. diastolic. This good condition has continued.

Case II.—A man, aged sixty-one years, with chronic nephritis and chronic bronchitis, had suffered from recurring attacks of nocturnal dyspnœa, with bloody expectoration for six years. During the summer of 1906 he developed swelling of the legs, and had several attacks of intense pulmonary œdema. In October his heart was considerably larger than in the previous May, with gallop-rhythm; and the systolic pressure, which had been 190 mm., was 170 mm. His liver was much congested and legs very œdematous, with one bedsore. There was constant dyspnœa and marked cyanosis. He had taken infusion of digitalis in Saratoga for weeks without benefit, and never slept a night without half a grain of morphine.

In spite of the apparently hopeless outlook, he was put on infusion of digitalis from a reliable pharmacy. In three days diuresis set in, and the dyspnœa left him, so that morphine was stopped entirely. In a week all œdema was absorbed. A month later he was free from dyspnœa and cyanosis, the liver was normal in size, gallop-rhythm scarcely evident, and systolic pressure 195 mm. The improvement was maintained for three months.

For hypodermic injection the tincture has been most commonly employed, but it is unfortunately irritating, and often causes abscesses or large hemorrhagic areas. Much labor has been spent in the endeavor to produce an efficient but non-irritating solution of digitalis. Two recent preparations, digalen and digitalone, are said to possess both virtues. Digalen has found great favor in Germany. I cannot say that in my hands it has proved less irritating or more efficient than the tincture, and many of my colleagues have had a similar experience. Digitalone seems to me decidedly less painful and fairly active; but there is as yet no ideal form for injection, and a good tincture is, perhaps, most certain in its action. Theoretically, strophanthus or strophanthin should be employed in preference to digitalis for rapid action, but I have not sufficient clinical experience to speak clearly on this point.

2. Use in Unsuitable Cases. The physician who gives digitalis to slow the heart in a paroxysm of tachycardia or in fever, to produce diuresis in acute nephritis, or to remove an inflammatory pleural effusion, is foredoomed to failure; yet all of these are attempted, and faith in digitalis for its rightful uses is lost in consequence.

The results of bedside experiment years ago made clear the indications for employing digitalis, but pharmacological studies have given us a much better insight into the reasons for these indications. In particular, the newer heart physiology, which we owe largely to Gaskell and to Engelmann, has illuminated many dark corners of the subject. We now think of the heart as an automatic organ, its muscle fibers endowed with five distinct functions: the power of originating rhythmic stimuli, conductivity for these stimuli, irritability to them, contractility, and tonicity. These functions are not evenly distributed throughout the whole heart. Normally, the rhythm originates in the auricles at the mouths of the great veins. The conducting muscular system can be traced anatomically, and, between auricles and ventricles, runs as a small bundle in the septum. The large muscular rings surrounding the mitral and tricuspid orifices are especially endowed with tone. These physiological facts have, in turn, pointed the way to the solution of many hitherto obscure pathological problems. Mitral stenosis so frequently produces irregularity of rhythm because of its tendency mechanically to damage the auricle. Stokes-Adams syndrome is now clearly the result of a lesion of the conducting bundle of His. Relative mitral and tricuspid regurgitations mean loss of tonus in the ring muscles. But, though the neurogenic theory of the heart's activity has been so generally abandoned, we must not lose sight of the great fact of nervous control. Through vagus and accelerator nerves the heart's automatic functions may be depressed or augmented, and its work coördinated to the needs of the whole organism.

Furthermore, the functions of the heart are influenced by its blood supply through the coronary vessels, by the variations in intraventricular pressure dependent on changes in arterial pressure or in the volume of blood discharged by the great veins, and by chemical alterations in the blood itself. Drugs may affect the heart in any of these ways. The digitalis series, though much remains obscure, clearly exert a direct chemical effect on the heart muscle itself, and indirect effects by vagus stimulation and vasoconstriction.

The direct action of digitalis is to increase contractility, tone, and irritability. In therapeutic doses, heightened tone and more complete ventricular emptying are evident even in the normal heart. When tone has suffered, as in dilatation, and systolic emptying is less efficient than normal, this action is still more pronounced. Loss of tone and diminution in systolic output are the cardinal indications for the use of digitalis.

Through stimulation of the vagus centre, digitalis acts to slow the heart. Unfortunately, such inhibitory action depresses tone as well as rate, and for this reason it is not a good remedy for tachycardia when no ventricular insufficiency exists. If pathological loss of tone is present, then the direct effect of digitalis on the heart muscle seems far to outweigh any indirect loss of tone through vagus influences, and slower rate brings increased efficiency. This, in turn, means improved coronary circulation and better nutrition of the heart muscle. For rapid heart action, therefore, one should use digitalis only when there is also some insufficiency of the ventricles.

Digitalis stimulates the vasomotor centre and causes more or less pronounced general vasoconstriction. This, together with improved ventricular efficiency, tends to increase the amount of blood in the arteries and diminish that in the veins. It is, therefore, the ideal drug to combat general venous stasis. There has been a widespread fear of this vasoconstrictor action in conditions of heart weakness associated with high blood pressure, which has led many to withhold digitalis whenever hypertension is present. Strophanthus has been urged as having less general action on the arterioles. However this may be in theory, I have yet to see the strophanthus which can compare with a good infusion of digitalis in overcoming passive venous congestion and œdema, whatever the primary cause of the failing ventricle. Blood pressure observations have shown clearly that, when the heart becomes insufficient in valvular disease, arterial pressure frequently rises, and ordinarily does not fall appreciably until death approaches. Digitalis may produce a functional cure with rising, falling, or stationary blood pressure. In addition, my personal records show plainly that cardiac failure supervening on prolonged hypertension is more frequently accompanied by a pronounced fall in pressure than under any other conditions. Experience, not *a priori* reasoning, has also taught me that these cases react to digitalis surprisingly well, and that a rising blood pressure usually accompanies improvement. Case II, already quoted, and Chart I show this clearly. Should such cases also receive vasodilators? I confess I do not know, and I am more afraid of these much-abused remedies in chronic nephritis than I am of digitalis. We must keep in mind the probable compensatory nature of much of the high tension of Bright's disease, and aim to interfere only when it can be held clearly responsible for danger. Anginal attacks, œdema of the lungs, or severe paroxysmal dyspnœa demand prompt relief of all extra strain on the heart. Gradual cardiac insufficiency, however, with falling pressure, does not seem to me at all a clear indication for vasodilators, and they should be given with careful control of their effects on arterial pressure and general capillary circulation.

Controversy has also centred around the use of digitalis in aortic insufficiency. To my mind the indications here are quite the same. We aim to correct function, not structural defects. Is there loss of tone and diminishing systolic output, with scanty urine, congested liver, and dropsy? Then give digitalis. When these phenomena appear in aortic disease, relative mitral incompetency frequently shows itself, and therapeutically and physiologically the problem differs little from primary mitral regurgitation. On the other hand, if the symptoms are merely orthopnœa or paroxysmal dyspnœa, or anginoid pain, then digitalis has no place. We should get away from anatomical categories in our medical treatment. Restitution of tissues we must leave to the inherent forces of the cells. Surgery alone attempts to repair structural damage. Medical therapeutics seeks restoration of normal function and must think in physiological terms. Nowhere is this more important than in dealing with the diseased heart, of which a correct anatomical diagnosis is so frequently possible as to tempt one to be satisfied with it alone.

One great advantage of the surgeon in estimating his successes has always impressed me in this connection. In all his statistics, inoperable cases are carefully eliminated from the calculation of results. Now, we medical men have our inoperable cases, too; more of them than the surgeon. We must endeavor to restore function, even when anatomical change has progressed to a degree incompatible with life. This is our duty. But, when we come to query the value of this or that method of treatment, we are justified in attempting to separate such cases as well as may be. If, for example, autopsy shows an extreme mitral narrowing, we must not blame digitalis for failing to save the patient. This postmortem elimination of medically inoperable cases seems to me needful, if we are to escape a pessimism which will cut short our usefulness as practitioners.

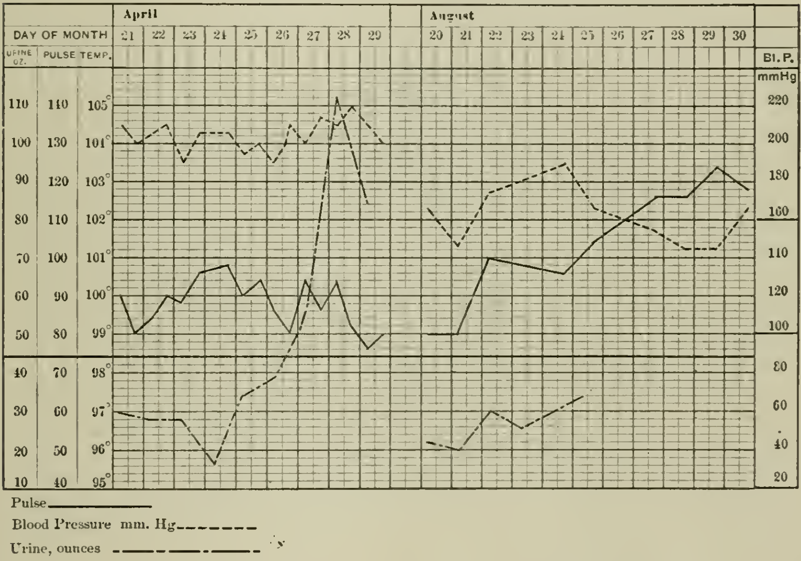

Chart I.—From man, about fifty years of age, with chronic nephritis and mitral insufficiency. April 21 to 29, prompt response to digitalis, with diuresis and rising blood-pressure and absorption of œdema. August 20 to 30, terminal fall in blood-pressure and rising pulse-rate uninfluenced by treatment. Died August 30, in the City Hospital.

3. Improper Dosage. The question of dosage is inseparable from the question of an efficient preparation. Text-books give half an ounce as the usual dose of digitalis infusion. I seldom need to use more than two drams of a good infusion, and larger doses of a poor preparation are mainly successful in deranging digestion.

How, then, when we are dealing with such variable quantities, shall we set up any guide to dosage?

The answer is simple. The only guide is the therapeutic result. This means a clear-cut picture of the indications for the drug in the particular case, close observation of its effects, and knowledge of its earliest toxic manifestations. Digitalis should never be pushed for more than a few days without careful records of heart as well as pulse rate, and of the amounts of fluid taken and urine passed each twenty-four hours. In cases of hypertension, blood pressure should also be recorded. Daily weighings are of great value in watching subsidence of œdema. Careful observation of the extremities, the serous cavities, the size of the liver, and the changes in size, sounds, and rhythm of the heart should be an established habit. In hospitals, graphic records are an immense help (Charts I and II). With these precautions, the dosage of an infusion may be increased from two drams to perhaps half an ounce, and of the tincture from ten minims to twenty minims every four hours. I do not believe the greater quantities should be exceeded, and they should rarely be necessary. Trial of digitalis procured from a different apothecary will be likely to succeed better. Of course

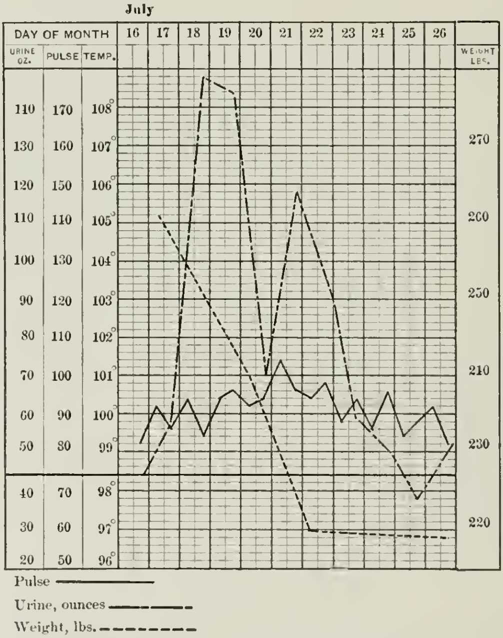

Chart II.—Rapid diuresis and loss of weight from absorption of general œdema and ascites, in a man aged thirty-eight years, suffering from chronic nephritis and dilated heart. St. Luke's Hospital.

forty-eight hours must elapse before the effects can be looked for.

Any marked decrease in urine is a danger signal not to be neglected, for, with diminished excretion of the drug, cumulative effects may supervene. Marked slowness and irregularity of the heart evidence the second stage of digitalis poisoning, with excessive vagus action. This stage may be wanting, however, and increasing rate, with irregularity, marks the onset of the third stage, due to excessive irritability of the heart muscle. Practically it is often difficult to be sure whether this condition, coming in a heart previously rapid and irregular, is due to too much or too little of the drug. Only careful record of the preceding events, and of the amounts of digitalis given, will permit of certain conclusions.

For minor grades of cardiac insufficiency, the continued use of small doses for weeks or months is often of advantage. These should be given at long intervals, every twelve or twenty-four hours, since digitalis is absorbed and excreted slowly.

4. Improper Methods of Administration. One of the commonest errors in judgment in digitalis therapy is persistence in administering it by the mouth, when frequent vomiting shows how little hope there is for absorption from the stomach. An equally serious error, under similar circumstances, is to withhold it altogether. Two other paths of absorption are readily available; the rectum, and the subcutaneous tissues. The rectum should always be given a trial when the stomach is intolerant and rapid action is not demanded. Half an ounce of infusion, three times a day, will give about as prompt results as by mouth.

Urgent symptoms and extreme passive congestion of the abdominal viscera are clear indications for hypodermic administration. Special cleanliness should be insisted on, because of the irritant nature of the solutions. Digalen has the merit of availability for intravenous use, and this may be recommended in desperate cases as a temporary expedient. The effect is naturally much more rapid. Intramuscular injection may also be tried.

The old-fashioned digitalis poultice, though some of its virtues were unquestionably absorbed, seems too uncertain for digitalis effect, and too costly as a poultice, to survive.

5. Neglect of Other Necessary Therapeutic Measures. To suggest that more than digitalis is needed in most heart cases seems an almost unnecessary commonplace. Not quite unnecessary, unfortunately, my experience has taught me. First in the list of adjuvant measures stands rest. This is least likely to be forgotten. Sleep is more often lost sight of. A few nights, robbed of their sufferings by morphine, may turn the scale and allow our other measures to work a cure. I remember one striking mitral case I was called to see, in which digitalis had been tried ineffectually for months and hope had been abandoned. Œdema was extreme.

For several weeks continued sleep had been out of the question. Two night's rest with morphine and forty-eight hours of tincture of digitalis hypodermically established diuresis and secured entire comfort. Infusion by the mouth completed the cure. The patient returned a few months later to her active duties as head of a very useful charitable society.

Restriction of the fluid intake, so essential in dropsical patients, is often forgotten, and the waterlogged sufferers thoughtlessly put on a milk diet. As an adjuvant treatment, the dry diet stands high. In like manner, free purgation will help relieve the secondary portal congestion, which causes much of the digestive disturbance in circulatory disease.

When anemia is marked, iron is essential, for anemia itself causes loss of tone of the heart muscle. In a different category come the vasodilating drugs, which must be given with digitalis to counteract its arterial constriction in certain cases of hypertension. I have already discussed this.

Finally, one of the more newly heralded therapeutic methods, new in name and conscious existence, but as old as the practice of the healing art, should be ever in mind at the bedside of the anxious victim of heart disease. I mean psychotherapy. Cheerfulness, courage, hope—these we should dipense in full measure at every visit, and they must come from the treasury of our own minds. If we would possess them, we must gain that confidence in the measures we employ which comes of thorough knowledge, and of the memory of wonderful results which have followed our intelligent use of digitalis in similar cases.

THE CLINICAL STUDY OF HEART CASES.[1]

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In the time allotted to me in the program of the evening it is obviously quite impossible to cover in any systematic way the subject of the clinical study of the heart. I cannot hope, and shall not attempt, to do more than touch upon a few isolated points which seem to me especially worthy of emphasis and refer briefly to one or two of the newer methods of clinical investigation.

It goes without saying that the clinical study of the heart is something vastly different from the mere physical examination of that organ. This latter, indeed, may be a relatively unimportant part of

[1] Read by invitation at a meeting of the Section on General Medicine of the College of Physicians of Philadelphia, January 13, 1908.

the study. Cases are not rare in which the physical exploration of the heart itself yields comparatively negative results, and yet the existence of serious organic mischief there is made plainly evident, either by the subjective symptoms or by some such obvious changes in other parts of the body as swelling and tenderness of the liver, marked pulsation in the veins of the neck, or œdematous swelling of the ankles. On the other hand, the presence of a heart murmur may have little or no practical significance if there are lacking all other evidences of cardiac and circulatory disturbance.

I trust I may be forgiven if, first of all, I take time to call attention to the urgent need of a careful inquiry not only into the existing subjective symptoms, but into the earlier history of the patient as well. Often a proper interpretation of the physical signs can be made only with the aid of such knowledge. It is obvious, for example, that a systolic murmur over the pulmonic area occurring in a child who has been more or less cyanotic since its birth has a very different significance from a similar one heard in a young woman with the history and symptoms of chlorosis, or from one found in a laborer, aged forty-five years, with a history of syphilis and of such symptoms as severe throacic pain and a hard, ringing cough.

Physical Examination of the Heart. Although in theory we are probably all agreed as to the necessity of employing, in the study of the heart, all the usual methods of physical examination—inspection, palpation, percussion, and auscultation—in practice I fear we are, many of us, prone to devote most of our time and thought to auscultation alone. This I am sure is a grave mistake. If, as Voltaire has said, speech is often a device for the concealment of one's thoughts, it is an equally true paradox that auscultation is sometimes a means of confusing and concealing a diagnosis. To make it of value it must have the support of the other methods of examination, and I do not hesitate to express my belief that the intelligent use of the combined methods of inspection and palpation will, in general, supply us with more useful information concerning heart conditions than will auscultation. The commonest sin of omission in the study of heart cases is, it seems to me, the neglect of these two most valuable methods of investigation.

The Venous Pulse. One of the important recent advances in the clinical study of the heart owes most of its stimulus to the work and writings of James Mackenzie[2] of Burnley, England, whose study of the venous pulse has done so much to make clear the significance of many of these vein movements in the neck and to direct attention to their clinical value as an index of the workings of the right auricle and ventricle. Mackenzie has also devised a simple instrument, the clinical polygraph, by means of which graphic tracings of these venous pulsations in the neck and liver are recorded in connection with ordinary sphygmographic tracings of the radial pulse—the two records running side by side on the same strip of paper.[3] By comparison with the tracing of the arterial pulse the complicated movements of the venous tracing may thus be accurately timed and rendered intelligible. Such graphic records are essential to the satisfactory study of the venous, pulse since many of the movements are too small and rapid to admit of their being accurately noted by the unaided eye or finger.

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[2] The Study of the Pulse, London, 1902.

Mackenzie has shown, among many other interesting things, that the so-called negative or normal, presystolic pulse in the veins of the neck is neither negative nor normal, but is a true regurgitant pulse from the auricle, and that, moreover, it is usually associated with a more or less distinct systolic wave indicative, he believes, of some slight tricuspid incompetency.

This method of studying the disturbances of the right side of the heart, by means of the clinical polygraph, is simple enough to permit it to be used in the ordinary clinical examinations at the bedside or in the consulting room and deserves a much more general use than it has thus far had in this country.

ORTHODIAGRAPHY. It will be generally admitted, I think, that the usefulness of the *x*-rays in the study of the heart has been much less than might naturally have been expected. The chief reason for this is to be found in the magnification and distortion of the outlines of the heart which are given to the shadow projected upon the photographic plate or fluoroscopic screen by the divergence of the rays as they come from their single point of origin at the anode. Since the degree of magnification depends not only upon the distance of the heart from the anode, but also upon the distance of the heart from the plate or screen, and since these two distances must vary with the depth of the chest, it has not been possible to formulate a general rule by which the error could be measured and allowed for. Thus far the most successful plan for obviating this difficulty has come from Moritz[4] in the method to which he has given the name of orthodiagraphy. The method has attracted wide interest in Germany, and seems to have become firmly established as much the most accurate means yet discovered for determining the size and contour of the heart. Time will not permit a detailed description of the apparatus, but its essential feature is a device for utilizing only the central rays coming from an ordinary Crookes' tube—those which fall perpendicularly upon the fluoroscopic screen. By moving the tube from place to place and by using only the perpendicular rays various points upon the circumference of the heart are determined in succession and marked upon the screen or chest wall. By the joining of these points an outline is obtained which represents very closely the true projection of the heart. As the method requires a somewhat elaborate apparatus as well as the services of a trained operator its use is likely to be restricted to such hospitals and other institutions as have a well-equipped radiographic department, but as it is at present the most accurate method known for determining the size of the heart its development marks a distinct advance in the study of that organ.

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[3] More recently McKenzie has devised an excellent portable ink-writing polygraph.

[4] Münch. med. Woch., 1900, xlvii, 992; 1902, xlix, 1; Deut. Archiv f. klin. Med., lxxxi, 1, and lxxxii, 1.

By means of it Moritz, Dietlen,[5] and others have made extensive statistical studies of the size, position, and form of the heart under both normal and pathological conditions. Among the many interesting facts thus elicited may be mentioned:

1. That with the change from the recumbent to the erect position there is a distinct sinking of the heart of from 2 to 4.5 cm., corresponding to the lower position of the diaphragm and liver, and that with this the heart assumes a more nearly vertical position, while the width of its shadow is considerably lessened.

2. That in old age there is regularly a lower level of the diaphragm and a correspondingly lower position of the heart, but in this case the organ, instead of having a more vertical position than usual, occupies one more nearly transverse. The explanation of this is probably to be found in the relaxation of the attachments of the great vessels by which the heart is held in position.

3. That in women the position of the heart is on the average an intercostal space higher than in men; and

4. That in asthma and emphysema there is a marked sinking of the diaphragm and heart, and that to this fact, even more than to the overlapping of the heart by the voluminous lungs, is to be ascribed the great diminution of the heart sounds in the second intercostal space and the low position of the upper border of cardiac dulness.

Percussion of the Heart. The development of the method of orthodiagraphy, so far from tending to cause the abandonment of percussion as a means of determining the outlines of the heart, has seemed indeed to increase the interest in it, for in the former method we now have a trustworthy gauge by which the accuracy of the various methods of percussion may be measured and their clinical value estimated. Some idea of the interest which has been aroused in the subject may be had from the fact that within the last two years no less than eighteen important papers and monographs upon the various aspects of cardiac percussion have come from Germany alone.[6] Probably the most important recent work on the subject is that of Moritz[7] and his pupil Dietlen.[8] Using orthodiagraphy to control their work they have tested the various methods of percussion with a view to determining the one which gives results most nearly in accord with their orthodiagraphic findings. Their conclusions are, briefly, as follows:

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[5] Deut. Archiv f. klin. Med., lxxxviii, 55.

[6] A full bibliography of the subject of heart percussion will be found in the monograph of Aravantinos, Die Percussion in der Bestimmung der Herzgrenzen, Berlin, 1907.

[7] Verhandl. d. XIX Congress. f. inn. Med., 1901, p. 524.

[8] See Moritz, Methoden der Herzuntersuchung, Deutsche Klinik, Band iv, Abt. ii, Nr. 15.

In order to obtain all the information possible it is necessary to outline both the relative and the absolute dulness. Contrary to the belief of many, it is possible by means of the relative cardiac dulness to obtain upon the chest wall a close approximation of the true projection figure of the heart. In determining the right border of relative dulness percussion should be made during forced expiration and with long and fairly heavy strokes, the pleximeter finger being pressed firmly against the chest. In determining the upper and left border of the heart the examination should be made during quiet breathing rather than forced expiration as the position of these borders is considerably changed by active respiratory movements.

In outlining the upper border and the upper part of the left border the percussion strokes should be especially heavy, as the layer of lung covering the heart is thickest at this point, and it is easy to make the error of placing the upper border too low. On the other hand, in mapping out the lower part of the left border, a common error is to place it too far to the left. This is most likely to occur in chests in which the lateral backward curve is marked and begins close to the sternum, and in cases in which the heart is much enlarged to the left. Under such circumstances heavy percussion will tend to bring out the dulness of the lateral aspect of the heart rather than that of its frontal surface only. For this reason percussion at this point should be light rather than heavy.

Orthodiagraphic studies have shown that, under pathological conditions, the apex beat is not a safe index either of the left border of the heart or of its lower border. Sometimes the beat occurs somewhat within the limits of the true border; sometimes, on the contrary, the shock transmitted to the chest wall may extend well beyond the left border. The lower border of the apex is to be found at a considerable distance below the position of the apex beat.

In order to determine accurately the length of the heart it is important to outline carefully both the left and the lower border of the apical portion. This, Moritz believes, can be done correctly in a majority of the cases, although it is, he admits, the least reliable part of cardiac percussion. The measurements of chief importance are three: (1) The long diameter; that is, the distance from the true apex to the point of junction between the upper right border of heart dulness and that of the great vessels (auricle-cava angle). In adults this measurement averages from 13 to 14 cm. according to sex, height, and weight. (2) The distance from the midsternal line to the point of dulness farthest to the right (average 3.5 to 4.5 cm.). (3) The distance from the midsternal line to the point of dulness farthest to the left (average 7.5 to 8.5 cm.).

In a large series of cases Dietlen determined these three measurements by the method of percussion just described, and compared them with the dimensions obtained in each case by subsequent orthodiagraphic examination. Counting errors of 0.5 cm. or less as negligible, his results are as follows:

In 135 males of from fifteen to seventy years:

	Per cent.
Distance to right, correct in	87
Distance to left, correct in	72
Both measurements, correct in	64
Long diameter, correct in	81
All three measurements, correct in	52

In 71 females of fifteen to sixty-one years:

	Per cent.
Distance to right, correct in	86
Distance to left, correct in	69
Both measurements, correct in	60
Long diameter, correct in	62
All three measurements, correct in	41

In 25 children of from three to fourteen years:

	Per cent.
Distance to right, correct in	100
Distance to left, correct in	96
Both measurements, correct in	96
Long diameter, correct in	92
All three measurements, correct in	88

It will be seen that his results were extremely good in children, whose thin and flexible chest walls furnish especially favorable conditions, and were least accurate in women. In this latter class it was the presence of large, fat breasts that made percussion difficult and inaccurate, especially in outlining the left border and the apical region.

My own experience with the above method of outlining the heart, while still too limited to permit me to pass judgment upon it, is yet sufficient to convince me that it is a more satisfactory method than any other that I have used, and that if pains are taken in carrying out the details it will, in a majority of cases, furnish a reasonably accurate projection of the circumference of the heart.

Concerning Goldscheider's[9] method of outlining the heart by extremely light percussion opinions differ. It has received some enthusiastic support, but the weight of evidence, thus far, seems opposed to it.[10] It is difficult, certainly, to find justification for it upon theoretical grounds.

As to the value of the absolute cardiac dulness a word should be said. Although there is very general agreement as to its normal limits and as to the need of using very light percussion in eliciting it, there still exists some difference of opinion concerning its usefulness.

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[9] Ueber Herzpercussion, Deut. med. Woch., 1905, xxxi, 333, 382.

[10] See discussion by Aravantinos, loc. cit.

Moritz insists that it should always be determined, since it often furnishes information which the relative dulness does not. He believes its increase to be conditioned especially upon dilatation of the right ventricle, and he points out that the area of absolute dulness may be considerable enlarged when there is little or no change in the limits of relative dulness.

Auscultation of the Heart. Concerning auscultation of the heart, there is time to touch upon only two or three points. Mackenzie[11] has made the interesting observation that in cases of mitral stenosis with secondary tricuspid insufficiency, when the venous pulse is of the systolic or ventricular type a presystolic murmur is never heard. The mitral murmur either occurs in the early part of the diastole or is absent altogether. In order that tricuspid insufficiency may produce a systolic venous pulse, it is obviously necessary that the right auricle be full of blood at the time when normally it is empty—that is, at the beginning of ventricular systole—for otherwise the blood regurgitated from the ventricle would be taken up by the empty auricle and its wave would not be transmitted to the veins. Mackenzie argues, therefore, that when there is a systolic venous pulse the right auricle must be so overdistended as to be incapable of effective contraction, or, in other words, that it is, for the time being paralyzed. He suggests that in the cases of mitral stenosis with tricuspid insufficiency and a systolic venous pulse, the constant absence of a presystolic mitral murmur can best be explained by supposing that under such circumstances there is paralysis of the left auricle as well as of the right. This theory finds some support in the recent recognition by physiologists of the dependence of the left auricle for its rhythmic impulse upon the integrity of the right auricle.[12]

The frequency with which, in cases of obvious tricuspid insufficiency, the usual systolic murmur at the base of the sternum is lacking has often been noted. I have convinced myself that in some of these cases the murmur is placed much higher than usual, and may be clearly audible in the second and third left spaces close to the sternum when it is absent altogether from the location commonly ascribed to it.

Lastly, reference may here be made to a point to which I have recently called attention,[13] namely, that the diastolic murmur of aortic insufficiency seems often to possess a quality which lends itself but poorly to transmission through the stethoscope, and that not infrequently a faint diastolic murmur may be heard with the naked ear when it is quite inaudible through the stethoscope.

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[11] Loc. cit.; also Quarterly Journal of Medicine, October, 1907.

[12] Erlanger and Blackman, Amer. Jour. Phys., 1907, xix, 125.

[13] New York Med. Jour., July 13, 1907.

IRREGULARITIES OF THE HEART RESULTING FROM DISTURBED CONDUCTIVITY.[1]

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Since the publication, in 1883, of Gaskell's experiments upon the heart of the tortoise,[2] the view has prevailed in physiology that the *primum movens* of the cold-blooded heart is located in or near the mouths of the great veins. Here the property of automatic rhythmicity is most highly developed, and here, therefore, arise the impulses which set the pace of the whole heart. These impulses arise at regular intervals near the mouths of the great veins and sweep over the heart, causing sinus venosus, auricles, ventricle, and bulbus arteriosus to contract successively in the order here given.

The presentation by Gaskell of an abundance of evidence proved these fundamental facts. For our purpose it will suffice, however, to refer to but one phase of this work, namely, that dealing with the blocking of the impulse on its way through the heart. This may be accomplished, as was shown by Gaskell, in one of two ways: (1) The impulse may be blocked gradually by cutting across the heart transversely at any level. When this is done carefully and gradually a stage is eventually reached in which that part of the heart located below the cut (this may be conveniently termed the distal heart) will beat perceptibly later than the part above (the proximal heart) with which it is now connected by a relatively narrow bridge of intact heart tissue. With further narrowing of the connecting bridge a stage may be obtained in which the distal heart fails to contract with every other beat of the proximal heart. The rate of the latter is to that of the former as 2 is to 1; to apply a term that has come into general use, the rhythm is 2 to 1. Higher grades of block, 3 to 1 and 4 to 1 rhythms, may also be obtained, but, with further cutting, the block to the passage of the impulse soon becomes complete despite incomplete anatomical separation of the two parts of the heart. The impulse starting in the more rhythmical parts of the heart can no longer reach the distal heart, and the latter, therefore, ceases to beat until it can, in case it beats at all, develop its inherent rhythmicity. Its rate of beat is then always slower than that of the proximal heart, it matters not through what level of the heart the cut may have been made. A similar stoppage of the distal heart with subsequent development of rhythm is seen when the cut is completed rapidly. Then, of course, none of the intermediate stages of block intervene. (2) The impulse may be blocked if instead of cutting the heart tissue, it be gradually compressed in a clamp.[3] Identical results are obtained with both methods.

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[1] Read by invitation at a meeting of the Section on General Medicine of the College of Physicians of Philadelphia, January 13, 1908.

[2] Jour. Physiol., 1883, iv, 43.

These experiments teach (*a*) that the upper parts of the cold-blooded heart are more rhythmical than the lower, (*b*) that the pace of the whole heart is normally set by the upper more rhythmical parts, and (*c*) that at the moment a less rhythmical part of the heart is severed physiologically from a more rhythmical part, the former at first stops beating and then, in case it possesses the property of automatic rhythmicity, it gradually assumes this function and begins to beat, otherwise it remains quiescent indefinitely.

Since the slightest obvious interference with the conduction of the impulse between any two parts of the heart manifests itself as an interval between the beats of such parts, Gaskell has concluded that in the normal heart the perceptible interval between the beats of the several chambers, sinus and auricles, auricles and ventricle, must be due to the existence in their junctions of a natural block to the passage of the impulse. The heart tissue in these places, he has pointed out, differs in structure and arrangement from those parts of the heart tissue that constitute the walls of the several chambers. These differences, in his opinion, suffice to account for the delay in the transmission of the impulse from chamber to chamber.

It is not a difficult matter to picture to ourselves in the case of the cold-blooded heart the irregularities of heart beat due to experimentally disturbed conductivity. Furthermore, the heart of cold-blooded animals lends itself well to experiments of the kind described above. Not only is it relatively simple structurally in that developmentally it is not far removed from the simple primitive heart tube, but in addition the heart possesses such a high grade of automatic rhythmicity that it may be removed from the organism and experimented upon as described and still continue to beat.

The conditions with which the experimenter has to deal in the case of the warm-blooded heart and particularly in the case of the mammalian heart are not quite so simple. Nevertheless, when due allowance is made for differences in structure and when appropriate methods of experimentation are employed, it can be shown that interference with the conduction of the excitation wave has much the same effects upon the heart beat in both classes of animals.

Structurally the mammalian heart differs materially from the cold-blooded heart. An anatomically distinct sinus venosus no longer exists, and there are present in it two completely separated auricles and ventricles. Since, however, the mammalian heart is evolved from the cold-blooded heart it should be possible for embryologists to determine their analogous parts. The problem is an old one. Very recently, however, Keith and Flack,[4] stimulated, apparently by the active interest taken in the subject by physiologists and experimental pathologists, have studied very carefully the comparative anatomy of the human heart and especially of those parts of the human heart which correspond with the junctions in the more primitive types. The results recorded are of the greatest interest and value to students of the manifestations of disturbed conductivity in the heart of man, and we may, therefore, be justified in quoting at some length the significant conclusions of their research.

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[3] Gaskell, Philosophical Trans., pt. III.

Keith and Flack first call attention to the fact that from the standpoint of comparative anatomy the typical mammalian heart may be divided into (1) the sinus venosus, (2) the auricular canal, (3) the auricle, (4) the ventricle, and (5) the bulbus cordis. "In the human and mammalian heart the musculature of the auricular canal has grown over and submerged the greater part of the sinus; two parts only are left exposed on the surface of the heart: (1) The musculature of the superior vena cava, and (2) the musculature of the coronary sinus." But on section "a second or deep stratum of the musculature is seen; this probably belongs to the sinus venosus, since it extends beneath the endocardium of the auricle, from the position of one venous valve to that of the other." There is also a part of the musculature "in the Thebesian and Eustachian valves, these being remnants of the right venous valves. There is often also to be found a thin muscular layer along the lower border of the fossa ovalis. . . ." All of these remnants of the sinus are in the right auricle. "It may be, however, that there are also remnants of the sinus in the left auricle of the human heart" around the orifices of the pulmonary veins. "Thus in the right auricle of the human heart there is musculature derived from three sources: (1) From the auricle proper, (2) from the auricular canal, (3) from the sinus venosus. . . . . All of these parts are in the freest muscular continuity."

"In the mammalian heart a distinct remnant of the sino-auricular junction, so well shown in more primitive hearts, can be recognized." Thus "in the human heart . . . an artery or arterial circle lies in the junction; the artery is surrounded by fibrous tissue in which are numerous peculiar muscle fibers, some nerve cells, and nerve fibers." "The muscle here has a structure quite similar to that of the auriculoventricular bundle."

The question whether there exists an anatomically distinct junction between the musculatures of the auricles is not considered by Keith and Flack. But all anatomists, so far as I am aware, describe direct continuity of a large part of the muscle fibers of the two auricles.

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[4] Jour. Anat. and Physiol., 1907, xli, 172.

It is hardly necessary to refer here, owing to the interest Philadelphians have taken in this subject from the very beginning, to the recent researches on the anatomy of the auriculoventricular junction. That the auriculoventricular bundle constitutes the only bit of heart tissue joining the heart tissue of the auricles with that of the ventricles is a fact that is now universally accepted. Keith and Flack describe the auriculoventricular bundle as a system of fibers which "begins in the '*knoten,*' a small mass of interwoven fibers in the central tendon of the heart, having slender connections with (1) the musculature of the interauricular septum, and (2) the circular fibers of the right auricular canal. From this arises the main bundle which passes along the upper border of the interventricular septum below the *pars membranacea septi.* Here it divides into a right and a left division which pursue a subendocardial course in the right and the left ventricles respectively, and, finally, fuse with the ventricular muscle."

There is no line of demarcation between the musculatures of the two ventricles. The work of MacCallum[5] has demonstrated conclusively that the ventricles, "instead of being a complex of fibers running at random, is merely a simple, long band of muscle with a tendon at each end as in other muscles." This band has its origin in the connective tissue of the auriculoventricular junction upon one side of the heart, passes around the outer wall of that side, thence to and through the ventricular septum, encircles the outer wall of the other ventricle and terminates in the *chordæ tendinæ* of that side. The musculature of the ventricles has therefore the arrangement of a scroll, and we may assume, in the absence of definite investigations upon this point, that the fibers of the auriculoventricular bundle make connection with the centre of the scroll.

Functionally the main difference between warm and cold-blooded hearts, from the standpoint of the experimenter, consists in the dependence of the former upon the coronary circulation. For physiological purposes the mammalian heart must be studied either while retaining its natural relation to the organism or when, after excision, its beat is maintained by the perfusion of its coronary system.

The studies of the anatomy of the mammalian heart outlined above should suggest to the investigator acquainted with the physiology of the cold-blooded heart that in the heart of mammals there are in all probability two natural blocking points: one at the junction of the rudiments of the sinus with the auricles (mainly in the right auricle), the other at the junction of the auricles with the ventricles, provided it can be shown that the impulse that causes the heart to beat starts in the sinus and traverses the auriculoventricular bundle; and it might be justifiable to infer further upon the same premise, that the natural block at the auriculoventricular junction is the more efficient. Practically all of these inferences have been justified by the test of experiment and it is with the results of such experiments that this paper principally deals.

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[5] Johns Hopkins Hosp. Rep., 1900, ix, 307.

The influence upon the heart beat of the block, both natural and experimental, has been studied most thoroughly in connection with the auriculoventricular junction, and we may therefore begin the physiological section of this paper with the presentation of the clearest subject. At the outset it may not, perhaps, be superfluous to state that the auriculoventricular bundle constitutes the only functional connection between the auricles and the ventricles of the mammalian heart. When this bundle, or practically nothing but it, is transsected in the excised artificially perfused heart[6] or when it is crushed in the heart retaining its normal relations to the organism,[7] the ventricles usually come to rest at once, whereas the auricles continue to beat with undisturbed rate and rhythm. Soon, however, the ventricles begin to beat, slowly at first, but the rate of beat gradually increases to a constant one which is, even when fully developed, always slower than that of the auricles. Now the auricles and ventricles beat quite independently of each other; the latter more slowly than the former. The justifiable inferences from these experiments are: (1) That the pace-maker of the mammalian heart is not in the ventricles (after section of the heart tissue the proximal heart beats more rapidly than the distal)—it lies either in or above the auricles; (2) that the ventricles of the mammalian heart are automatically ryhthmical, but that while they are driven by the auricles their rhythmicity is held in abeyance—it develops gradually when they are thrown upon their own resources. Furthermore, the pause between the contractions of auricles and ventricles of the normal heart (As-Vs interval) is satisfactorily accounted for by the fact that the impulse, in passing from one to the other of these regions, must traverse a long narrow bridge.

On account of the minuteness of the auriculoventricular bundle its conductivity cannot well be gradually impaired by slowly cutting into it. It may, however, be so impaired by gradually compressing it in a specially devised clamp applied to the normally beating heart.[8] In this way all grades of impaired conductivity, such as we have described in connection with the cold-blooded heart, may be obtained. These, in order of their appearance, consist of (1) an increase in the

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[6] His, Jr. Zntrbl. f. Physiol., 1895, ix, 469. Humblet: Arch. intern. de physiol., 1904, i, 278. Hering (read March 10, 1905), Prager med. Wochenschrift, xxx, No. 14; also, Pflüg. Arch. 1905, lvii, 97.

[7] Erlanger (read March 20, 1905), Bull. Johns Hopkins Hosp., 1905, xvi, 202; also, Jour. Exp. Med., viii, 8. v. Tabora: Ztschr. f. exp. Path. und Therap., 1906, iii, 499.

[8] Erlanger. loc. cit.

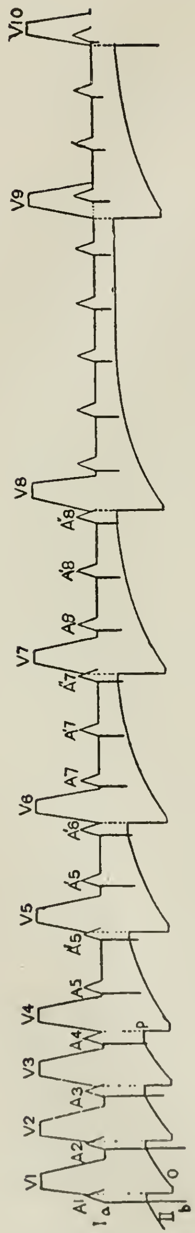

Fig. 1.—Diagram to illustrate the genesis of heart block. For description see text.

As-Vs interval. (2) The occasional failure of the ventricles to respond to the regularly contracting auricles—these "ventricular silences" may recur with great regularity, for example, after every tenth, ninth, or eighth, etc., auricular contraction. (3) The failure of the ventricles to respond to every other auricular contraction — a 2 to 1 auriculoventricular rhythm. (4) A 3 to 1 rhythm. (5) Relatively complete auriculoventricular heart block (of which more in a moment). (6) Absolutely complete auriculoventricular heart block. These several disturbances in conductivity I have attempted to make clear by means of a diagram[9] (Fig. 1) based in part upon experimentally demonstrated facts, in part upon logical inferences from such facts. In the figure the line I shows diagrammatically the movements of the heart, A1, A2, A3, etc., being the contractions of the auricles; V1, V2, V3, etc., the contractions of the ventricles. Line II represents diagrammatically the variations in the irritability of the ventricles. It is an old observation, one dating from 1876,[10] that with each contraction of heart tissue its irritability is completely annulled. During the phase of contraction heart tissue does not respond to stimulation, but during the phase of relaxation and during the pause following it the irritability returns and then gradually increases. The increase, rather rapid at first, becomes slower and slower as the irritability approaches its maximum level. The curve of irritability included between successive ventricular contractions tends, therefore, to approach the level of maximum irritability asymptotically, that is to say, it tends to become parallel to the base line. These variations in the irritability of heart muscle are explained as follows: The resting heart tissue stores within itself an unstable energy yielding material, the instability of which increases as it accumulates. A stimulus strong enough to elicit a contraction does so by decomposing all of this material. The irritability of the heart tissue, it may be assumed, depends upon the amount of the unstable substance present in it at any one time. Immediately after the heart has contracted it, therefore, contains none of the unstable substance; consequently it is non-irritable. But after the heart has completed its contraction the material begins to accumulate rapidly at first and then more and more slowly; the irritability, when it returns, therefore increases rapidly at first but finally becomes more or less constant. Or stated in another way, shortly after the completion of a contraction, a stimulus to be efficient must be relatively strong, but as time passes a relatively weaker stimulus becomes effective. Indeed what has been termed the inner stimulus may, in case the heart tissue is not otherwise disturbed, become efficient and cause the heart to beat spontaneously. It is justifiable to assume further, that the strength of the impulse starting in any part of the heart depends upon the amount of the unstable material decomposed by the contraction associated with it. In other words, the strength of the impulse in general varies with the interval between contractions. Finally the latent period of contraction of heart tissue varies inversely as the strength of the stimulus producing the contraction, and inversely as the irritability of the heart tissue. That is to say, a relatively strong stimulus produces a contraction with a short latent period, while in the case of a stimulus of a given strength acting upon a more or less irritable tissue, the resulting contraction will in the former case have a short latent period, in the latter a long latent period.

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[9] Erlanger. Amer. Jour. Physiol., 1906, xvi, 160.

[10] Marey. Trav. d. Lab., 1876, 73.

I do not wish to give the impression that the factors taken into consideration in the development of this theory are the only ones that play a part in determining the behavior of the heart toward interference with the transmission of the contraction wave through it. Although, apparently complex, it is the simplest explanation of the complex manifestations of heart block and it is hoped that it may prove as useful to the clinician as it has to me as a working hypothesis in the elucidation of the phenomena of heart block.

The diagram depicts the results of gradually clamping the auriculo-ventricular bundle. Pressure exerted upon the bundle will have the effect of reducing the efficiency of the auricular impulse that reaches the ventricles. The efficiency of this impulse is represented by the length of the heavy line dropped from the foot of the auricular wave. It is assumed that this impulse is efficient whenever the line representing it intersects the curve of irritability of the ventricles (II). A ventricular contraction then results. The duration of the latent period of the ventricular contraction is represented by the length of the horizontal line at the crest of the waves of irritability (on II).

We are now in a position to explain with the aid of the diagram the various grades and phases of disturbed conductivity at the auriculoventricular junction. The first two cardiac cycles[11] are normal. The impulse (*ab*) descending from the auricles (A1 and A2) into the ventricles are much stronger than a barely efficient one. The latent period of ventricular contraction is short.

The rest of the diagram depicts some of the effects of gradually clamping the auriculoventricular bundle. The first effect is to diminish the strength of the impulse (line descending from foot of A3); it is still, however, efficient (intersects the curve of irritability of the ventricles II), but, the stimulus being weaker, the latent period of contraction of the ventricles—the As–Vs interval—is longer. The same is true in the case of the fourth cardiac cycle (A4, V4) the only difference being a still greater divergence from the normal. The auricular impulse (A5) of the fifth cardiac cycle (A5, A′5, V5), owing to the increase in the resistance to its passage through the auriculoventricular bundle, does not reach the curve of irritability of the ventricles; in other words this impulse is subminimal. The ventricles, therefore, do not contract and their irritability instead of falling to O continues to increase. On account of this increased irritability the impulse associated with the next auricular beat (A′5), although no stronger than that of A5, is efficient and the ventricles contract. The latent period of the ventricular contraction is shorter than that of the preceding one (V4) for the reason that the irritability of the ventricles is higher while the efficiency of the auricular impulse (A′5) is still relatively great. A continuance of this state of affairs would result in a lasting 2 to 1 auriculoventricular rhythm. A slightly greater block to the passage of the impulse through the auriculoventricular bundle may so alter the relation of efficiency of impulse to irritability of ventricle that the rhythm becomes 3 to 1. This is shown in cycles 7 and 8 in the diagram. Rarely, however, are higher rhythms, 4 to 1 and 5 to 1, seen in the mammalian heart. The reason for this, illustrated in the diagram, is to be found in the fact that although the auricular impulses may succeed in penetrating into the ventricles they always remain subminimal with respect to the irritability of the ventricles. They therefore cease beating until their inherent stimulus suffices to originate a contraction, when they beat automatically and quite independently of the auricles. We now have before us the condition that was termed above relatively complete block. It is relatively complete because the degree of block depends upon the efficiency of auricular impulses in relation to the irritability of the ventricles. If we could by some means increase the irritability of the ventricles the block might become partial again; so, too, might the block become partial if we could increase the efficiency of the auricular

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[1] It is convenient for our purposes to define cardiac cycle as those events that intervene between the beginning of an auricular contraction immediately following a ventricular contraction, and the beginning of the auricular contraction immediately following the next ventricular contraction.

impulses. As a matter of fact it does lie within our power to vary the strength of the auricular impulse. This, we have assumed above, may be accomplished by altering the rate of the auricular beats, an increase in rate being associated with a diminution, and a decrease in rate with an increase in the efficiency of the impulse. In the latter case, for example, the impulse of the third or fourth auricular contractions following V8 might have become efficient stimuli. Then the block would have become partial, and in the former case the efficiency of the auricular impulse A″8 might have fallen below that required for stimulation of the ventricles, and the partial block then existing might have become relatively complete. The arrhythmias associated with other forms of heart block are easily comprehended when viewed in the light of this hypothesis.

SINO-AURICULAR HEART BLOCK. So far as I am aware a condition that might unequivocally be termed sino-auricular heart block has never been experimentally produced. Nevertheless the anatomical description of the heart given above would seem to indicate the possibility of there being another natural blocking point at the sino-auricular junction. Although there is in this place no narrow muscular bridge such as is found at the auriculoventricular junction still we find here interpolated between the sinus and the auricle a peculiar heart tissue. We find very little more than this at the sino-auricular junction of the cold-blooded heart, and yet most physiologists, following the lead of Gaskell, believe that it suffices to account for the S;s–As interval in that heart; it, in other words, acts in that heart as the natural block to the passage of the impulse. And it seems to me possible that under pathological conditions, such for example as occlusion of the artery lying in the sino-auricular junction of the mammalian heart, the tissue in this junction might be so impaired functionally as partially or completely to block the passage of the impulse.

However that may be, the question presents itself for consideration: Is there any evidence that in the mammalian heart the impulse arising in the *primum movens* (assuming this be in the mouths of the great veins) is materially delayed in the sino-auricular junction? In the present state of our knowledge this question cannot be answered. None of the recent workers in this field has, so far as I am aware, succeeded in satisfactorily recording the contractions of the superior vena cava simultaneously with those of the auricles. And since, according to Keith and Flack, the superior vena cava is the only part of the sinus of the mammalian heart that is not incorporated within the tissue of the auricle, the problem of determining by direct methods the duration of the normal S;s–As interval, if such interval there be, seems to be impossible of direct solution.

Another question then suggests itself, namely: Is it possible artificially to block the passage of the impulse through the region of the mammalian sinus, using for this purpose methods similar to those employed by Gaskell in his study of conduction in the cold-blooded heart? That this can be accomplished has been demonstrated by experiments which, although indirect, are I believe none the less conclusive.[12] A block has been established in the following way: The heart of a rabbit is excised and perfused with Locke's solution. A heavy thread is passed through the right auricle entering by way of the inferior vena cava and leaving by way of the superior. After the heart has begun to beat normally gentle traction is exerted upon the projecting ends of the thread so as to elevate a cone of auricular tissue. Naturally this cone includes the mouths of the great veins and a variable amount of the tissue of the right auricle bordering upon them. While holding the thread taut the two projecting ends are twisted one upon the other. The torsion is, of course, not limited to the thread, but is continued to the auricular tissue drawn up by it. In this way, therefore, a large part if not all of the sinus region of the auricles is compressed, the greatest tension being exerted, however, upon the base of the cone. It is impossible in an experiment of this kind to record or even to see the contractions of the part of the heart twisted. Nevertheless by these means an irregularity of heart beat has been repeatedly obtained which, when viewed in the light of the remarks of the preceding section, could be caused only by the interposition of a block in the way of the impulse from a more rhythmical to a less rhythmical part of the heart. When the torsion is quickly exerted upon the sinus region of the right auricle the whole heart may apparently cease to beat just as the ventricles may cease beating when an auriculoventricular block is suddenly established. After a variable pause (in Fig. 2 the first pause lasts about six seconds) the heart may contract with normal sequence, that is, auricles first, followed in a moment by ventricles. Then there succeeds a shorter pause followed by another apparently normal contraction and so on until a constant but slow rate obtains. This period of the experiment corresponds with the development of rhythm in the ventricles after the establishment of complete auriculoventricular block, and without doubt some part of the heart without the twisted area is here developing the rhythm that determines the beat of the auricles and ventricles in lieu of the *primum movens* which the operation has rendered functionless with respect to the rest of the heart.

The constant but slow auriculoventricular rate that next obtains is in all probability the expression of complete sino-auricular block. Now, in case the treatment to which the auricle has been subjected has not permanently damaged the tissue concerned with the origination of the normal beat, the heart will, when the tension is removed, slowly but completely resume its normal state. At first, during such recovery, the visibly beating portions of the heart may contract at intervals almost exactly equal to thrice the normal period, evidently 3 to 1 sino-auricular block, and then there may be seen in successive stages sino-auricular block of alternating 3 to 1 and 2 to 1, 2 to 1, alternating 2 to 1 and 1 to 1, and, finally, the normal 1 to 1 rhythms (Figs. 3, 4, and 5). That is to say, the heart periods will in the first case be alternately equal to three and two normal periods, then to two normal periods, then alternately to one and two normal periods, while, finally, the heart may beat just as it did before its rhythm had been disturbed. These irregularities, even in the absence of any direct evidence that some part of the heart above the assumed block is throughout the experiment beating at the normal rate, practically prove, in the light of the hypothesis developed above, that such is actually the case. The experiment then suggests that the *primum movens* is situated above the lowermost edge of the twisted part of the auricle. That such is the case is indicated by the fact that in the dying heart, this is the part of the heart which may show the last contractions. It is likewise the part that may first begin to beat when the quiescent heart is perfused.[13] And in at least one of the several experiments the cone of the auricles picked up by the thread, after having been separated functionally from the rest of the heart, by means of a crush through its base, was seen to beat more rapidly than, and independently of, the other parts of the heart.[14]

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[12] Erlanger and Blackman. Amer. Jour. Physiol., 1907, xix, 125.

Sino-auricular heart block, or at least partial sino-auricular heart block, is characterized then by the occurrence of heart cycles whose durations are simple multiples of that of the normal heart cycle. Admitting this to be a correct criterion, then partial sino-auricular heart block has been casually observed in man by Wenckebach[15] and in the dog by Hering.[16] In neither case could the exact cause of the arrhythmia be determined.

AURICULO-AURICULAR HEART BLOCK. The term auriculo-auricular heart block is self-explanatory. It is a condition in which the conductivity of the tissue joining the two auricles is depressed to such an extent that the impulse that causes the heart to beat is blocked either partially or completely on its way from one to the other auricle. Experimentally the impulse may be so blocked in the excised heart of the rabbit either by a line of crush or by means of actual separation with scissors.[17]

I shall consider first the effects of the functional separation of the right auricle from the left auricle plus auricular septum by means of a cut parallel to, and just to the right of, the line of junction of the auricular septum with the vault of the auricles. Let this cut be so planned that there is left between the two auricles a bridge of uncut

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[13] MacWilliam: Jour. of Physiol., 1888, ix, 167. Hering: Pflüger's Arch., 1900, lxxxii, 21. Fredericq: Arch. intern. d. physiol., 1906, iv, 57. Erlanger and Blackman: Loc. cit.

[14] Erlanger and Blackman. Loc. cit.

[15] Arch. f. Physiol., 1906, 297

[16] Ztschr. f. exp Path. u. Therap., 1906, 511.

[17] Erlanger and Blackman. Loc. cit.

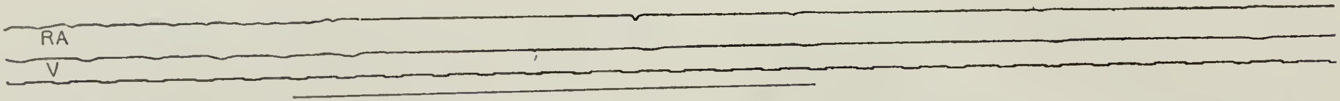

Fig. 2.—To show the production of, and the different stages of recovery from, complete sino-auricular block resulting from the twisting of the region of the great veins. Before, there was a 2 to 1 auriculoventricular block. The duration of torsion is indicated by the line just below the time record. Time-interval between two symmetrical marks is one second. Down strokes are contractions. Rabbit.

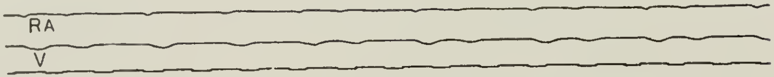

Fig. 3.—Shows the change from a sino-auricular block of the 2 to 1 type to a block of the alternate 2 to 1, 1 to 1 type. Now, none of the auricular impulses are blocked at the auriculoventricular junction

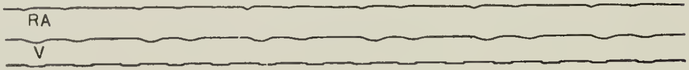

Fig. 4.—Shows alternate 2 to 1 and 1 to 1 sino-auricular block.

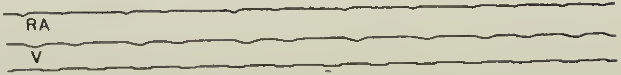

Fig. 5.—Shows the return to normal sequence from an alternate 2 to 1 and 1 to 1 sino-auricular block.

auricular tissue which, however, is damaged to such an extent that impulses cannot at first make their way across it from one auricle to the other. At the moment this is accomplished the left auricle and auricular septum may at once come to rest, whereas the right auricle continues to beat with undisturbed rate. After a short pause, however, the left auricle with attached septum begins to beat, perhaps slowly at first, but more rapidly later when its rhythmicity is fully developed. Then the left side contracts regularly, but more slowly than, and independently of, the right (Fig. 6). We have here, to coin a word, complete dextauriculo-septolevauricular heart block. Subsequently, with the gradual disappearance of the block, there occur in turn the several stages of partial block such as 3 to 1 dextauriculo-septolevauricular heart block when the left auricle plus septum contracts after every third beat of the right auricle, 2 to 1 block (Fig. 7), and then perhaps the normal rhythm with a perceptibly long interval between the contractions of the right and of the left auricle, or as we might call it by analogy, a long dAs-SelAs interval, and finally the heart beat becomes absolutely normal.[18]

The auriculoventricular bundle, the physiological connection between the auricles and ventricles, lies, as we have seen, in the septum. The beat of the ventricles in an experiment of the kind just described is determined, therefore, by the beats of the auricular septum, and since the connection of the left auricle with the septum is undisturbed, the left auricle and the ventricles beat with the sequence that obtains in the intact heart.

The experiments upon sino-auricular heart block described above proved the most rhythmical part of the heart to be in the right auricle in the region of the mouths of the cavæ. The experiment just described confirms this finding in that it shows the right auricle to possess a higher degree of rhythmicity than the left auricle plus the auricular septum. In addition the experiment demonstrates that the left auricle plus the septum like the right auricle and the ventricle is automatically rhythmical; for in the case of complete separation of the two parts both beat, although independently of each other—the left side always more slowly than the right.

Let us consider next the effect of separating functionally the left auricle from the right auricle plus the auricular septum, altering the method described above only in so far as the position of the cut is concerned. In this case the cut is carried through the vault of the auricles just to the left of, instead of just to the right of, the septum. The left auricle usually stops beating at the moment the functional separation becomes complete, whereas, the right auricle and septum continue to beat without the slightest change in rate (Fig. 6). The left auricle in a vast majority of experiments does not beat again as long as the functional separation is complete. In this respect the

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[18] Wenckebach (loc. cit.) has obtained from man tracings which he believes show the right auricle to be beating independently of the rest of the heart.

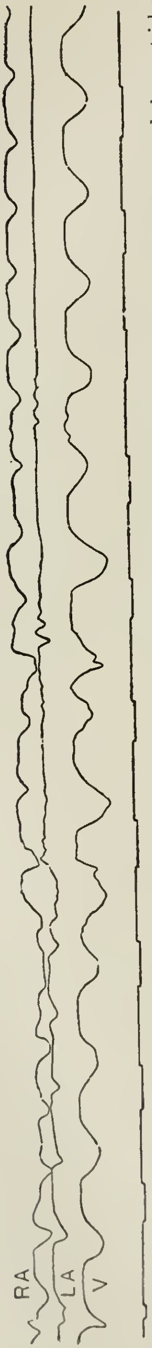

Fig. 6.—Shows at the beginning complete blocks between the right auricle and the left auricle plus the septum, and between the latter and the ventricles. Later (at irregularities), the left auricle was separated from the auricular septum and stopped beating at once. Down strokes are contractions. Rabbit.

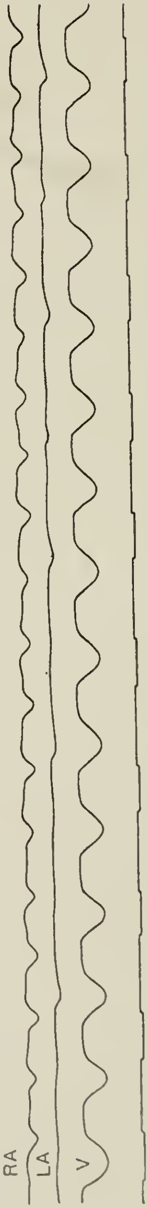

Fig. 7.—Shows the ventricles beating independently and the left auricle responding at first to every fourth contraction of the right auricle, then to the third, and then to every second to the end of the tracing. Down-strokes are contractions. Rabbit.

separation on the one hand of the left auricle and upon the other of the left auricle plus the septum from the right yields different results. The difference is due to the fact that, whereas, the left auricle plus the septum possesses automatic rhythmicity, the left auricle alone does not or possesses it to but a slight degree. Evidently the septum alone is automatically rhythmical since it is the part of the heart that determines the beat of the left auricle when together they are separated from the right. That the septum is automatically rhythmical may be proved by the direct experiment of separating it from both of the auricles by cuts through the vault to either side of it. Then the septum may be seen to beat independently of the two auricles and to determine the beat of the ventricles, while the right auricle beats more rapidly than it, the left auricle remaining quiescent.

To complete the consideration of the effects of separating functionally the right auricle plus the septum from the left auricle, as the conductivity of the connecting bridge gradually returns and the impulse of the right auricle succeeds in penetrating into the left, the various stages of partial block make their appearance. And we may, therefore, see 3 to 1, 2 to 1, etc, septodextauriculo-levauricular heart block.

Many other forms of heart block have been produced in the laboratory, but those which have been described here in barest outline are the ones which, for anatomical reasons, ought to be of the most frequent occurrence in the experience of the clinician. Just as partial and complete block may be established experimentally between any two parts of the heart, provided one of the parts be spontaneously rhythmical, by narrowing the functional connection between them, so, too, the same forms of block might well be produced by pathological processes of a kind that severs the functional connection of one part with another. When a transitory block is thus established by a lesion to repeat, the less rhythmical part at first stops beating but, in case it possess spontaneous rhythmicity, it soon begins to beat again, first in complete block and then in partial block with all of the rhythms that have been observed for example in the transitory auriculoventricular block. Naturally, auriculoventricular block of all the forms will be found to be, and has been found to be, the most common clinically, not alone for the reason that the narrowness of the connection between the auricles and the ventricles makes easier its partial and complete destruction by disease, but also because the clinical manifestation of auriculoventricular heart block (Stokes-Adams disease) are unmistakable. While it may be possible in particularly clear cases of auriculoventricular heart block to make a correct diagnosis without the aid of the more exact methods of investigating the organs of the circulation, the more obscure cases of this form of heart block, but especially the other forms of heart block, can be recognized only with the aid of the graphic method.

AN OBSERVATION ON THE JUGULAR PULSE OF MAN.[1]

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PHILADELPHIA.

The revival of interest in the venous pulse of man, following the publication of James Mackenzie's[2] work, has, as a natural result, given rise to considerable discussion as to the cause and significance of the various waves which go to make up the venous pulse. Controversy arose over the first or auricular wave of the jugular pulse, the *a* wave of Mackenzie, while the origin and time of the third large wave, Mackenzie's *b*, occasioned even greater dispute. The second wave of the jugular pulse, wave *c*, which interrupts the first negative phase after the auricular wave, was formerly ascribed to numerous causes; after Mackenzie's publication, however, these seemed disposed of and his explanation, namely, that wave *c* was due to the impact of the neighboring carotid, was generally accepted. As recently as the early part of 1906, Wenckebach,[3] in an exhaustive article on the venous pulse, stated that he agreed with Mackenzie and all other recent writers in regarding the wave called *c* as chiefly a carotid product. Today such unanimity no longer obtains, since within the last year Leon Fredericq[4] and Morrow[5] have sought to disprove the carotid origin of the wave *c* and, more recently, Bard,[6] Cushny and Grosh,[7] and Hirschfelder[8] have expressed a like doubt.

Briefly stated, the arguments in favor of the carotid origin of wave *c*, as advanced by Mackenzie,[9] Wenckebach, and others, are: (1) Its time falls within the time of active ventricular systole, synchronous with the carotid pulse. (2) The size of this wave varies significantly according to the nearness of the pressure point of the receiving cup to the carotid artery, and according to the depth at which it is placed in the neck tissue. (3) The wave *c* is absent in the "liver pulse." (4) During irregular heart action, when the venous pulse continues and the arterial pulse is absent, in tracings of the jugular pulse taken at this time the carotid wave is not seen. (5) When there is a distended jugular bulb the *c* wave is not apparent in the venous tracing. (6) When the carotid wave is very prominent in a jugular tracing, its shape often is almost identical with that of a tracing of the carotid pulse. Although some of these observations have been challenged, as yet no adequate proof of their inaccuracy has been advanced.

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[1] Read by invitation at a meeting of the Section on General Medicine of the College of Physicians of Philadelphia, November 11, 1907.

[2] The Study of the Pulse. Edinburgh and London, 1902.

[3] Beiträge zur Kenntnis der menschlichen Hertztätigkeit. Archiv f. Anatomie und Physiologie, 1906, Physiol. Abtlg., p. 297.

[4] La seconde ondulation positive (première ondulation systolique) du pouls veinieux physiologique chez le chien. Bulletin de l'Académie Royale de Médicine de Belgique., 1907.

[5] The Various Forms of the Negative or Physiological Venous Pulse. Brit. Med. Jour., December 22, 1906, p. 1087.

[6] Des divers details du pouls veineux des jugulaires chez l'homme. Journal de physiologie et de pathologie générale. Paris 1906, viii, 466.

[7] The Venous Pulse. Jour. Amer. Med. Assoc., October, 12, 1907.

[8] Some Variations in the Form of the Venous Pulse. Johns Hopkins Hospital Bulletin, June, July, 1907.

[9] The Interpretation of the Pulsations in the Jugular Veins. Amer. Jour. Med. Sci., 1907, cxxxiv, 12.

It is a noteworthy fact that those observers who most vigorously oppose the accepted cause of wave *c*, almost without exception, have based their observations on experiments performed upon animals in which the jugular veins were dissected out and isolated. They lose sight of the fact that the *c* wave under discussion is one obtained from the surface of the neck of man, where the veins make their changes in volume felt in the overlying structures. It is evident, therefore, that comparison is being made between phenomena which are not identical.

Morrow took tracings from the exposed right jugular of a dog in which the right carotid had been clamped below the level from which the tracing was taken. The left carotid was taken simultaneously, but no cardiogram was made with which to compare the jugular tracings. In these tracings Morrow obtained a small wave following the auricular one and occurring at the time of the beginning of the carotid pulse. He assumed that this small wave was *c* and that, all carotid influence having been eliminated, it must be caused by some other factor. He advanced several theories as to its cardiac origin.

By far the most complete experimental work has been done by Leon Fredericq. On anesthetized dogs Fredericq exposed the carotid and external jugular, and, after the vein was protected from all transmitted pulsations, he recorded simultaneously tracings of the venous pulse and of the carotids and a cardiogram of the right heart. Immediately following the first or auricular wave he observed a small second rise, which he called *bc*, which in its time corresponded a little late with the first part of the up-stroke of the cardiogram, and more or less with the beginning of the carotid pulse.

Fredericq next demonstrated that *bc* occurred in tracings of the right auricle and superior vena cava near the auricle, and, further, that at this level the beginning of *bc* coincided with the beginning of the systole of the right ventricle, but preceded the beginning of the carotid pulse. From these facts he concluded, that, although *bc* is produced earlier at the heart than the arterial pulse, since the arterial pulse, *i. e.* the carotid pulse, travels 6 to 8 meters per second whereas the venous pulse travels only 2 meters per second, the arterial pulse overtakes the wave *bc* at the level of the neck. Hence the coincidence in time which is usually observed, a fact which Fredericq infers accounts for the seeming relation which exists between the *c* wave in the jugular pulse of man and the carotid pulse. The other writers who doubt the carotid origin of *c* apparently base their doubts largely on the above-mentioned experimental work.

It is obvious that both Morrow and Fredericq effectually eliminated all possibility of the carotid influencing their jugular tracings, and they certainly demonstrated that in the neck veins of dogs, as Chauveau has shown for the horse, there is a wave following *a* which coincides with the beginning of ventricular systole. It seems, however, by no means proved that the usually prominent *c* wave of the jugular pulse of man, occurring at a time when ventricular systole is fully established, is identical with this small wave which occurs earlier in its relation to the cardiac cycle.

It seemed, therefore, important to determine, if possible, the presence or absence of a wave in the jugular pulse of man which should correspond in the time of its occurrence to the wave *bc* of Leon Fredericq; and thus, if found present, to demonstrate that this wave, which Fredericq and Morrow confused with the *c* wave, exists in man as well as in dogs and occurs along with and entirely independent of the carotid wave.

On examining a clear cardiogram, there will often be found a little notch on the up-stroke of the tracing. The interval between the exact beginning of the rise due to ventricular systole and the top of this notch represents that part of the ventricular systole during which the ventricular pressure is steadily being raised until the hitherto closed semilunar valves are opened and active systole begins. The notch marks the opening of the semilunar valves, and the interval before this occurs may be termed a *ventricular presphygmic period,* or, as it has been called by some, the "*Anspannungzeit.*" It will be noticed that the wave *bc* of Fredericq occurs during this period of the cardiogram.

Therefore, in seeking a like wave in man only those tracings were used in which, if not a clear ventricular presphygmic period (Anspannungzeit) occurred, at least a suggestion of one was present in the cardiogram, and in which the venous pulse was clear. Some difficulty was experienced, due to the fact that the exact beginning of ventricular systole is often difficult to determine accurately. Further, it must be borne in mind that as the ventricular presphygmic period is an event recorded at the heart itself, any event in the jugular pulse which corresponds to this period in the cardiac cycle must be represented on the tracings as occurring slightly later. Such retardation was observed by Professor Wenckebach and me, but our estimate of the time of the delay was less than that recently given by Hewlett.[10]

The tracings examined were taken from persons normal as to their cardiovascular systems, as well as from those with grave lesions of the heart or kidneys. A number of jugular tracings showed a second distinct wave following the *a* wave and preceding the *c* wave (Fig. 1). But, upon carefully measuring the exact time of this wave, it was found that often it coincided exactly with or actually preceded the ventricular presphygmic period.

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[10] The Interpretation of the Positive Venous Pulse. Jour. Med. Research, October, 1907.

Fredericq has shown that his wave *bc* was originated by the beginning of ventricular systole. He demonstrated that it was present when the auricles ceased contracting and the ventricles continued to beat; and that when ventricular contractions ceased the wave also disappeared in spite of auricular systole going on. It is evident, therefore, that those waves which in the tracings studied by me fell with or before the ventricular presphygmic period, could not be the same as Fredericq's wave, since, in the jugular pulse, at the period in question, that is before the ventricular presphygmic period, the influence of ventricular systole is not yet evident.

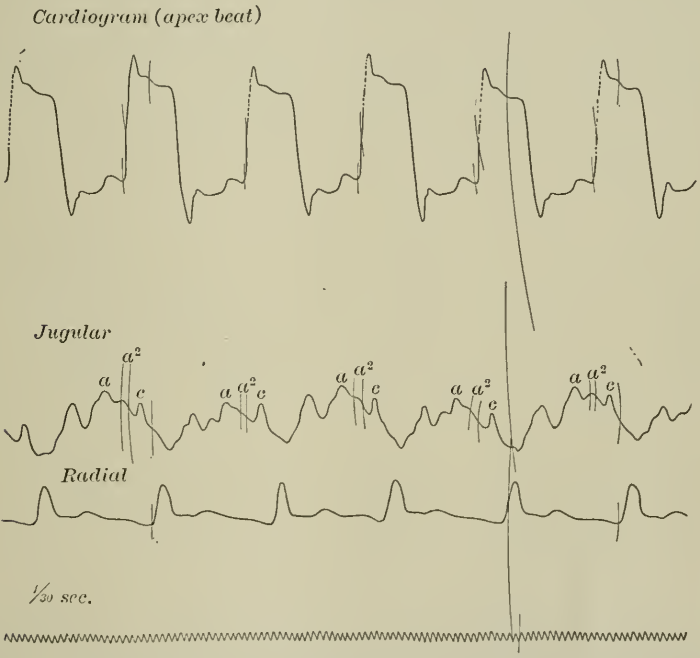

FIG. 1.—The jugular pulse shows the doubling of the auricular wave. The second rise of this (a^2) falls in or before the ventricular presphygmic period, which is indicated by the markings on the cardiogram.

That a wave had to be dealt with which was in the nature of a double *a* wave seemed all the more certain, since in some cases of heart block a beautifully clear wave was found, which followed immediately after the waves due to auricular systole, even when the latter were not succeeded by any ventricular contraction. Consequently, the influence of any ventricular systole as a factor in the cause of these double *a* waves was absolutely excluded in such cases. An illustration of this is seen in Fig. 2. It was evident, therefore, that care had to be taken not to confound a double *a* wave with the wave which was being sought.

The examination of other tracings revealed, in addition to this doubling of the *a* wave, still another small wave which fell just after or in the latter part of the ventricular presphygmic period, but invariably came before the beginning of active ventricular systole and hence preceded the *c* wave. Such a tracing is shown in Fig. 3, in which, at the bottom of a double auricular wave, a small but distinct wave is seen, designated by the letter *b*. By using the radial pulse as a means of comparing events in the jugular pulse and cardiogram, it is found that *b* occurs just after the ventricular presphygmic period. The foregoing seemed the proof that, aside from any double *a*, there exists in jugular tracings of man a small wave which corresponds in time to the wave found by Morrow and Fredericq in dogs, and which is clearly separate and distinct from the carotid wave (Mackenzie's *c*).

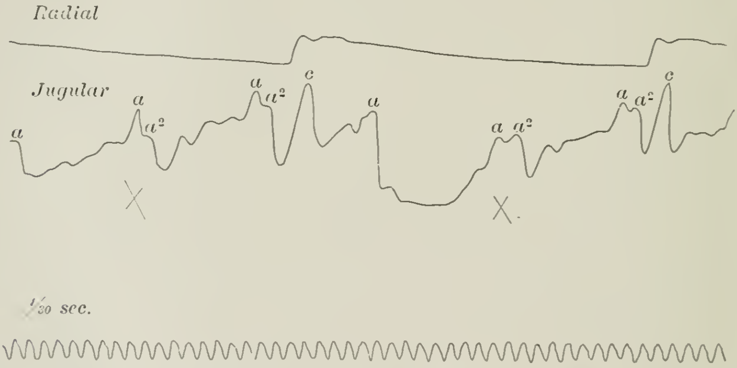

FIG. 2.—Heart block in which the jugular pulse shows a double *a* wave (a^2), even when the auricular contraction is not succeeded by a ventricular systole, as at (X).

The occasional presence of the wave in question has been noted in a recent paper by L. Bard. In at least one of his tracings, he points out a wave in regard to the identity of which, with the one under consideration, there is little doubt. Bard called this wave *i*, but in view of the newer lettering of the venous pulse adopted by D. Gerhardt, Wenckebach, and others, in which one of the postsphygmic waves is called *i*, it was suggested by Prof. Wenckebach that this small second wave of the jugular pulse of man might appropriately be called wave *b*. We should have, therefore, the following convenient sequence of lettering: *a*, the auricular wave; *b*, the wave above described; *c*, the carotid wave; and *d*, the

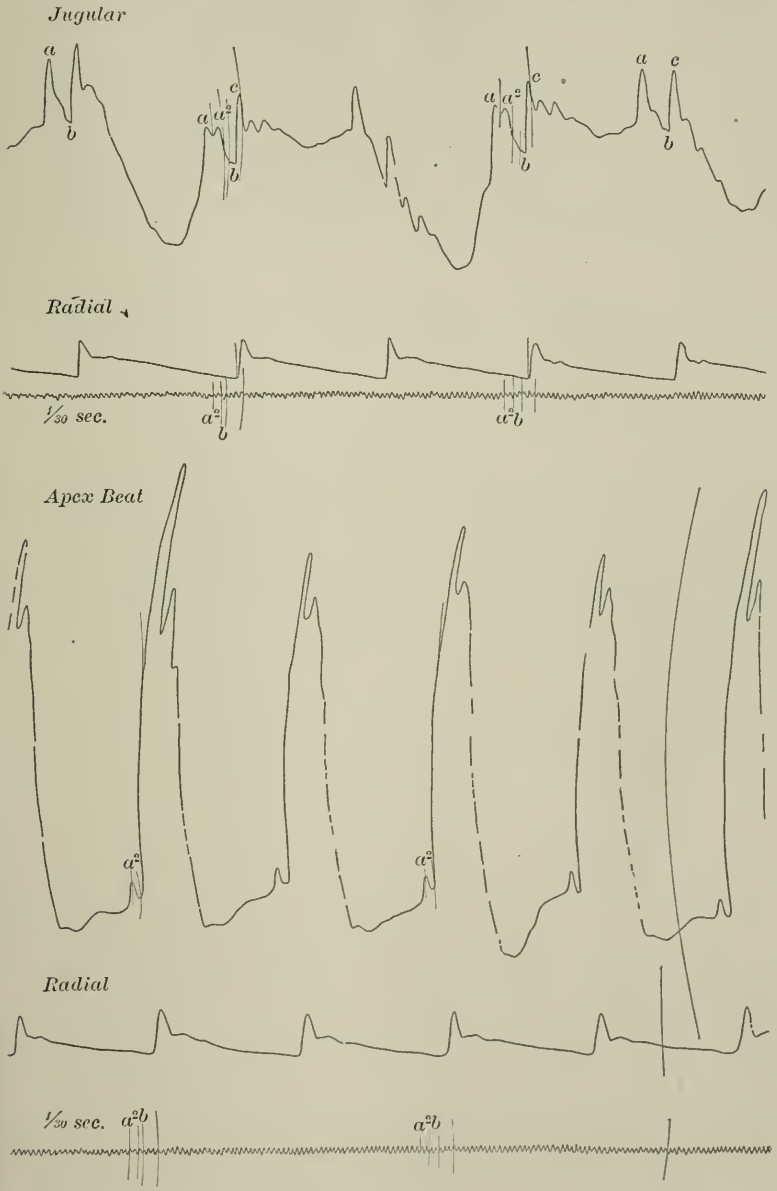

FIG. 3.—In the jugular pulse there occurs at the bottom of the double *a* wave another small wave, *b*. Wave *b* occurs just at the end of the ventricular presphygmic period and always precedes the beginning of *c*. The jugular pulse and the apex beat must be compared by means of the radial pulse.

diastolic wave of Wenckebach and Gerhart,[11] erroneously called *v*. The letter *v* should be reserved for such phenomena as occur during ventricular systole only. In a paper which appeared about

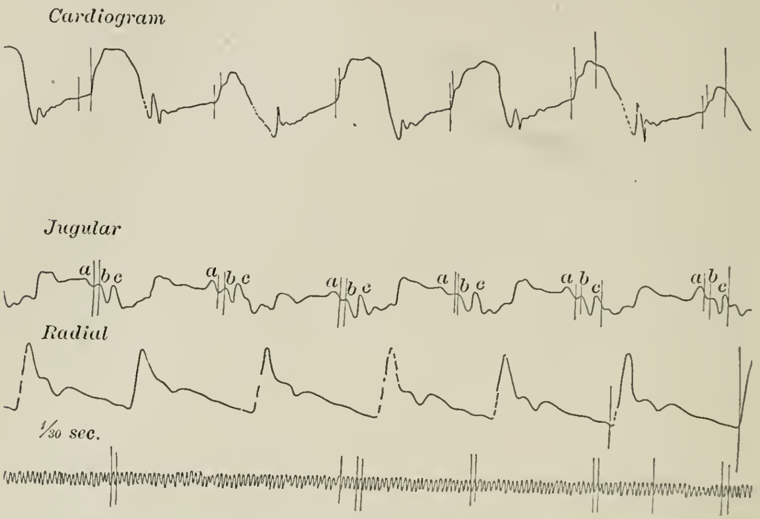

Fig. 4.—Wave *b* occurs as a distinct wave interrupting the down stroke of the *a* wave. It always occurs just after or in the last part of the ventricular presphygmic period, which is clearly shown on the cardiogram.

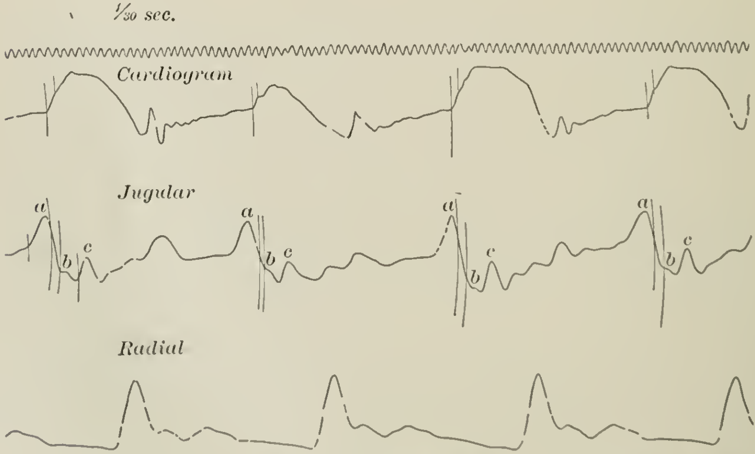

Fig. 5.—Wave *b* occurs just after the ventricular presphygmic period and is seen as a distinct elevation between the bottom of the down stroke of the *a* wave and the beginning of wave *c*.

[11] Klinische Untersuchungen über Venenpulsationen: Archiv. f. exp. Pathologie u. Pharmakologie, 1894, xxxiv, 402.

the same time as Bard's, Hirschfelder[12] makes no mention of the *c* wave as such, but describes, as the second wave of the jugular pulse, a wave similar in time to the above noted *b* wave; none of the tracings in this paper, however, seem to show a *b* wave.

The double *a* being of comparatively rare occurrence, the additional wave *b* was found most often following the usual single auricular wave. Its character was by no means constant, as may be seen from the accompanying series of tracings. In Fig. 4, *b* appears as a distinct wave interrupting the down stroke of *a*. In Figs. 5 and 6 an obvious wave is seen between the bottom of *a* and the beginning of *c*. Not infrequently *b* shows more as an outbowing on the descending limb of *a* than as an abruptly rising wave. Of this type Fig. 7 furnishes an example. Again, there are tracings which show no clear *b* wave, but in which, during a distinct interval before the beginning of *c*, there is the suggestion of a small wave *b* (Fig. 8). Finally, *b* may appear as a wave at the beginning of the up-stroke of *c*. Fig. 9 shows this, although in this tracing the ventricular presphygmic period is not clear; nevertheless, *b* obviously falls in the first part of the systolic ventricular rise of the cardiogram. In spite of these variations as to form, the time of *b* remains unchanged. In

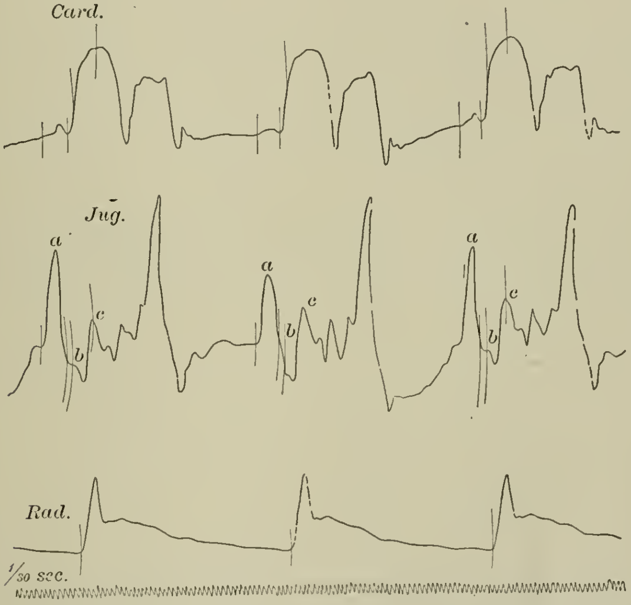

FIG. 6.—Wave *b* occurs at the bottom of the *a* wave when the latter follows a pause after an extra systole.

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[12] Graphic Methods in the Study of Cardiac Disease. AMER. JOUR. MED. SCI., 1906, cxxxii, 378.

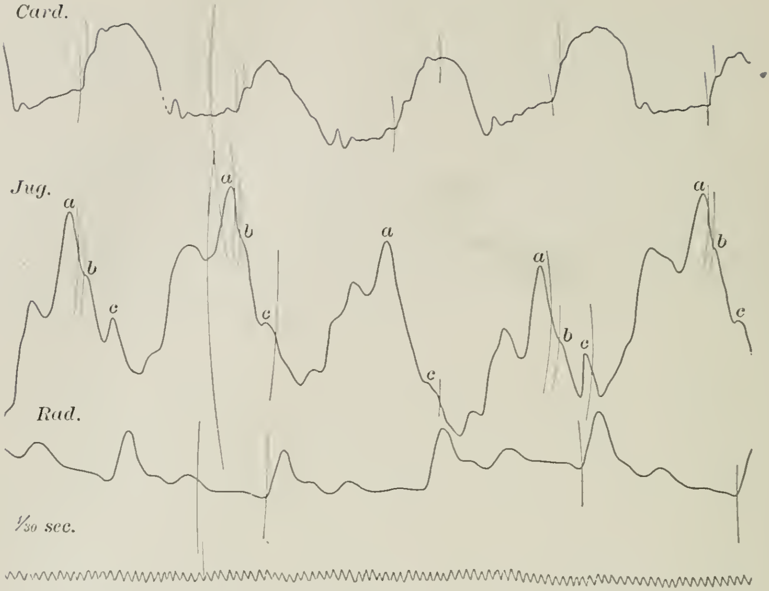

FIG. 7.—Wave *b* appears on the down stroke of the *a* wave more as an outbowing than as an abruptly rising wave, but its relationship to the ventricular presphygmic period is always correct.

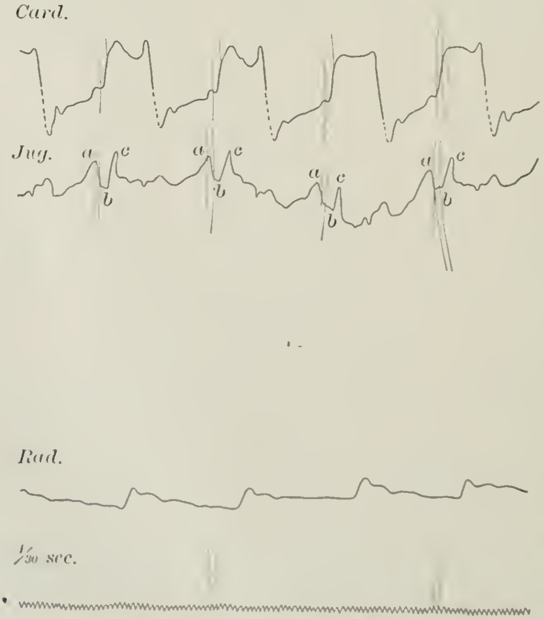

FIG. 8.—There is no distinct *b* wave in the jugular pulse, but in the interval between the end of *a* and the beginning of *c* the suggestion of one is evident.

the tracings examined it always occurred just after or in the last part of the ventricular presphygmic period.

This wave *b* is always small and by no means apparent in all jugular tracings, but when present can be no mere accident, since it is observed not only throughout a single tracing, but in repeated tracings from the same individual, even when they are taken on different occasions. Its occurrence is probably somewhat dependent upon the length of the *a*-*c* interval and the prominence of the *c* wave.

The cause of wave *b*, in the absence of definite experimental proof, remains a matter of speculation, although there seems no good reason for not accepting the suggestion of Leon Fredericq, namely, that this wave is due to the augmentation of the intraventricular pressure before the opening of the semilunar valves, and that this increased pressure communicates itself to the contents of the auricle across the auriculo-ventricular orifice closed at this moment by the tricuspid valves whose leafletts bulge toward the right auricle. Bard gave a like explanation of the cause of his wave *i*, and Hirschfelder attributed the second wave of the venous pulse to these same factors.

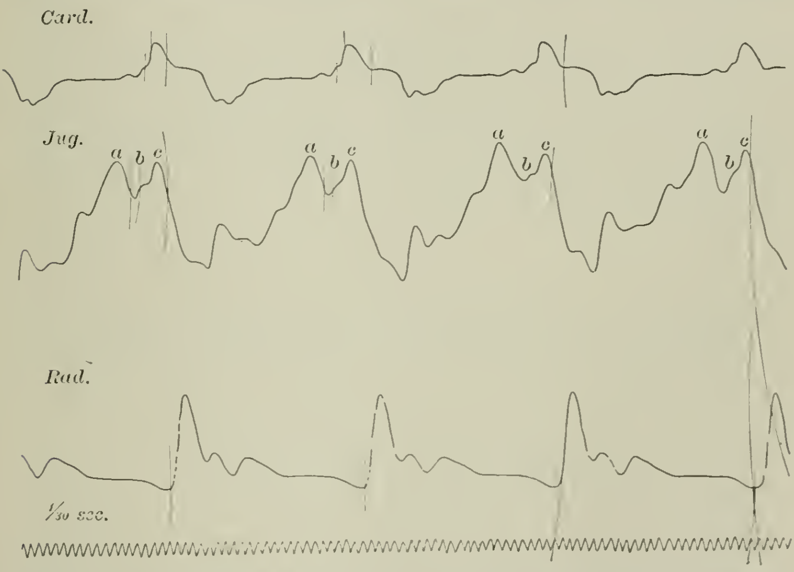

FIG. 9.—Wave *b* appears as a distinct elevation on the first part of the ascending limb of wave *c*. Although the ventricular presphygmic period is not clear in the tracing, wave *b* obviously falls in the early part of the systolic ventricular rise of the cardiogram.

From the foregoing considerations the following conclusions seem warranted:

1. There are not sufficient grounds to doubt that the *c* wave in the jugular pulse of man is, as Mackenzie said, anything but a carotid product.

2. The jugular pulse of dogs, even when all carotid influence is eliminated, shows a small wave at the beginning of ventricular systole.
3. In man a double *a* wave is sometimes found, the second rise of which cannot be identical with the wave described in dogs, since its occurrence is too early.
4. In addition to any double *a* wave in man, another wave, appropriately called wave *b*, often shows between *a* and *c* and begins just after or in the last part of the ventricular presphygmic period.
5. Since the wave found in the jugular pulse of dogs at the beginning of ventricular systole has its counterpart in the *b* wave of man's jugular pulse, the assumption that the wave found in dogs is identical with Mackenzie's *c* wave is unjustifiable.

I gratefully acknowledge the many kindnesses shown me by Prof. K. F. Wenckebach, at whose suggestion this work was undertaken. In addition to the admirable facilities afforded in the Laboratory of Clinical Medicine at Groningen, Prof. Wenckebach generously placed at my disposal for study a large series of tracings, which, together with those that I made myself, supplied the material for the observations above recorded.

PRIMARY CARCINOMA OF THE VERMIFORM APPENDIX.

A STUDY OF 90 CASES, 3 PREVIOUSLY UNPUBLISHED.[1]

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The increasing reports of isolated cases of primary carcinoma of the appendix, which one finds in the literature, testify not only to the greater interest now manifested in the study of the pathological anatomy of that organ, but also to the greater care exercised in its examination, whether removed at operation or on the autopsy table. A sufficient number of such neoplasms have now been recorded to make a critical study of them interesting and instructive. To the 87 cases that I have found reported in the literature, I desire to add the following 3 cases:

Case XXII.—An unmarried, German, immigrant girl, aged twenty years, was admitted, on September 5, 1907, directly from the steamer to the Presbyterian Hospital, to the service of Dr. F. T. Brown, to whom I am indebted for the privilege of taking care of and reporting the case. Except for some seasickness, she had been well up to two days prior to landing, at which time she was taken with severe pain in the right side of the abdomen. She had fever, and was markedly prostrated. The right lower quadrant of the abdomen became very tender to pressure. On admission to the Hospital her temperature was 101°, and her pulse 100. The leukocytes were 23,000, and the polymorphonuclears 88 per cent. She had never been sick before, and there was no history of any pelvic disturbances. While evincing evidences of considerable prostration, at the same time she was very well nourished, and there was no sign of any cachexia. Physical examination showed the heart and lungs to be normal. The abdomen was distended and there were no respiratory abdominal movements. The whole right lower quadrant was rigid and very tender, both these signs shading off from a point of maximum intensity, situated at McBurney's point, where there was felt a mass the size of a lemon. Over this mass there was tympany, and there were no signs of free fluid in the abdomen. Rectal examination showed the pelvic organs to be normal, and no mass could be felt, but there was considerable tenderness high up in the right fornix.

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[1] The reports of 15 additional cases were found after this article had been completed. Since it was impossible to include them in the detailed study, they have been added in an appendix. The total number of cases reported, therefore, is 105.

Immediate operation was performed. An intermuscular incision, about two inches long, was made over the mass. On opening the peritoneum, the inserted finger pushed aside an adherent coil of intestine, which opened an abscess, well walled in, containing about 2 ounces of fœtid, thick, creamy pus. After sponging the cavity dry the appendix was found hanging over the brim of the pelvis, to whose walls it was adherent. On delivering it into the wound, it was seen to be about four inches long and as large as one's index finger. Its serosa was intensely congested, and about one inch from its base there was a gangrenous patch, in the centre of which there was a small perforation. Its tip was clubbed and hard, as though there was a concretion in its lumen. The meso-appendix was clamped in sections and divided. Two catgut ligatures were applied about its base, between which the appendix was amputated. The stump was cauterized by the Paquelin, after which a second plain catgut ligature was applied about the stump, which was followed by a second cauterization. The cavity was sponged out, and into it were inserted two small cigarette drains. The abdominal wall was sutured by layers, closely about the drains. The patient made an uneventful recovery, the wound being completely closed by the twenty-fifth day. The girl went home on the thirtieth day.

At the time of the operation there was no suspicion that the appendix, on external examination, was affected with anything more than an intense, acute suppurative inflammation. Owing to the lateness of the hour in the evening of the operation, the appendix was not cut open, but, following the ordinary routine, it was sent as it was removed to the pathologist, by whom a gross section of the organ was made, and this revealed, macroscopically, that the tip, for half an inch, was occupied by a small fibrous appearing mass which completely filled the lumen. There was no concretion present. No suspicion of malignancy whatsoever was aroused at the time of the operation, as there was no tumor visible on the external surface, the tip being merely clubbed. No enlarged glands were seen in the meso-appendix.

The following is the report of the examination of the specimen by Dr. F. C. Wood, of the Pathological Department of Columbia University: The material consists of four transverse sections of the appendix. Two of the fragments include a considerable portion of the meso-appendix. The other two are transverse sections of the free part of the organ. The appendix is considerably enlarged, measuring about 12 mm. in diameter after hardening. Two of the sections show merely a dilated appendix with no mucosa and a somewhat chronically inflamed peritoneum and subserous coats, the wall measuring 4 mm. in thickness. The other two specimens, which include the meso-appendix, show the following changes: The wall is thickened, measuring 6 mm. This thickening is chiefly in the submucosa and muscularis. At the periphery of the appendix and in the meso-appendix are a large number of leukocytes and blood. The leukocytes are chiefly polynuclear, many of them of the eosinophile group. The rest are lymphocytes and plasma cells.

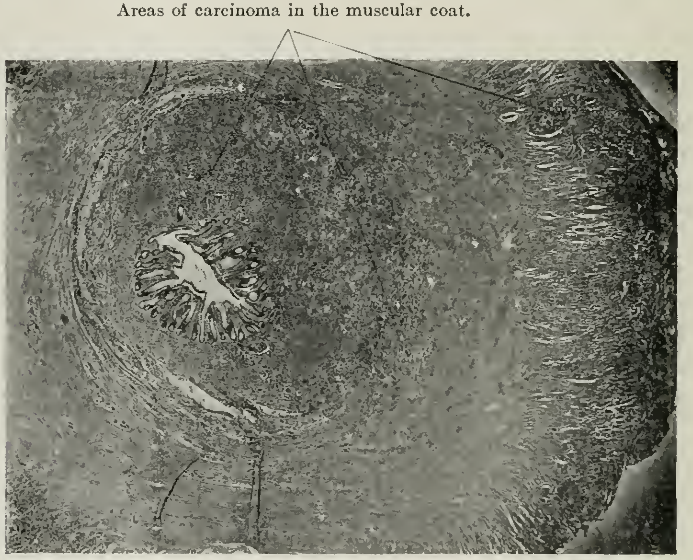

Fig. 1.—Carcinoma of the appendix (Case XXII), showing general distribution of the growth throughout the wall of the organ. (Low power.)

The fat of the meso-appendix is infiltrated, and there is a formation of a considerable amount of new connective tissue in the form of granulation tissue. The bloodvessels are distended with blood. There is a thrombus in one of the larger veins. This more or less active inflammation extends entirely around the appendix, although in the portion opposite the mesenteric attachment the inflammation is much less than on the other side. The mucous membrane of this portion of the appendix is normal and the surface is unbroken. The submucosa, the muscularis, and the subserosa are infiltrated with cells arranged in large and small masses in the tissue spaces (Figs. 1, 2, and 3). These cells are polyhedral (Figs. 4 and 5); there is no connective tissue between the individual cells; the nuclei are large and show well arranged chromatin network. Mitotic figures are scanty. None of the carcinomatous masses show any tendency to an alveolar formation, nor are there any high cylindrical or mucous cells. While the newgrowth extends up into the lymphoid tissue underneath the lining membrane of the lumen of the appendix, this epithelium is in no place broken through, nor in direct connection with the growth. The infiltrated tissue shows the usual evidences of chronic inflammation, and many wandering tissue cells of the type of plasmacytes and plasma cells are present in the muscle bundles near the newgrowth. The exact histogenesis of the tumor cannot be established from the specimen, as the entire appendix is not available for section; but the possibility of the tumor having arisen from the mucous membrane cannot

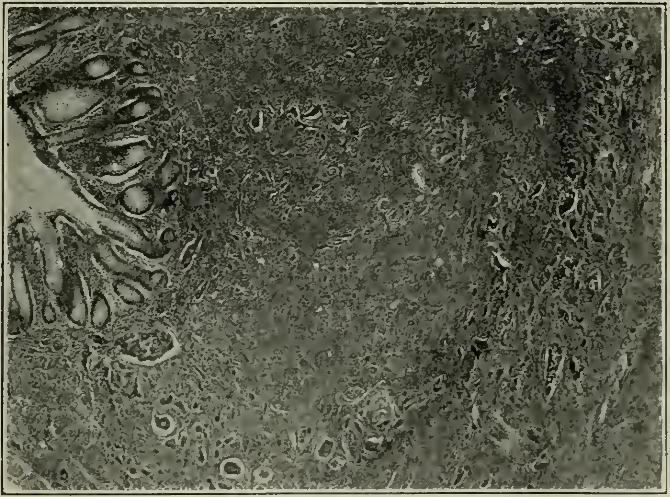

Fig. 2.—Carcinoma of the appendix (Case XXII), showing general distribution of the growth throughout the wall of the organ. (Medium power.)

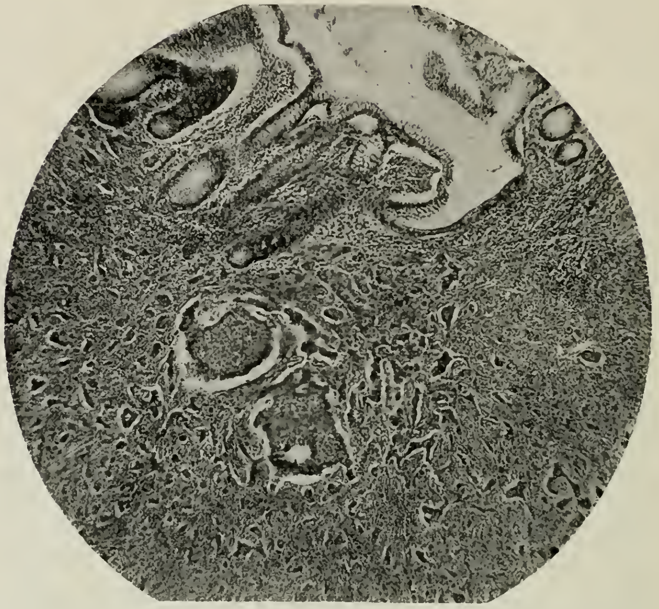

FIG. 3.—Carcinoma of the appendix (Case XXII), showing the topography of the growth beneath the mucosa. (Medium power.)

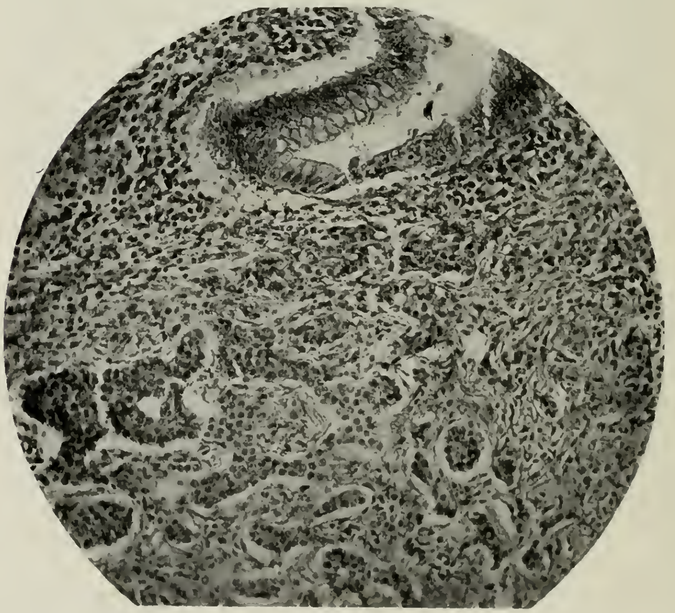

FIG. 4.—Carcinoma of the appendix (Case XXII), showing solid alveoli filled with polyhedral cells invading the submucosa. (High power.)

be excluded. The diagnosis is carcinoma of the appendix, polyhedral cell type; acute peri-appendicitis.

Case XXVII.—Operator, Dr. A. J. McCosh. A male, aged twenty-five years, was admitted to the Presbyterian Hospital, New York, April 7, 1897. His difficulty began in the previous August, when he had sudden cramp-like pains in the right lower abdomen, accompanied by vomiting. No abdominal tenderness (?). The pains lasted two weeks. The next month, September, he had a similar attack, lasting three weeks. He was well until the following March (an interval of six months), when he was taken with sudden tenderness and pains in the right iliac fossa, abdominal distention, and vomiting. On admission, he was just recovering from this last attack. On examination there were rigidity and tenderness in the right iliac fossa. At the operation there was no fluid in the abdomen. There was felt a mass, 3½ inches in diameter and 1½ inches deep, with no pulsation in it. It was gradually mapped out, running obliquely behind the posterior peritoneum from the sacrum up to the right side. The appendix not seen. An aspirating needle introduced into the boggy tumor withdrew no pus. It was deemed a malignant mass, involving the cecum, appendix, and peritoneum. Removal was considered impossible, and the wound was closed. The patient was readmitted January 4, 1899, twenty months after his first operation. For the past eight months he has had attacks of cramp-

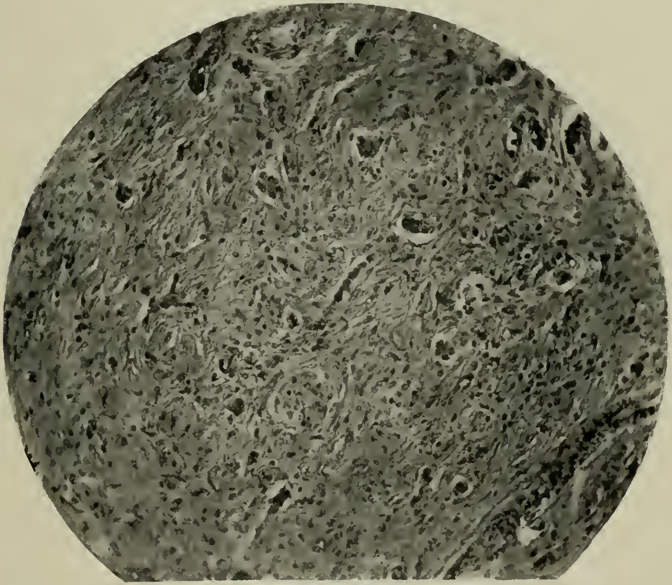

Fig. 5.—Carcinoma of the appendix (Case XXII), showing solid alveoli filled with polyhedral cells. (High power.)

like pains in the region of the old scar, and these attacks are now recurring much more frequently. Has lost no flesh or strength; never jaundiced, and bowels regular. On examination, in old appendix wound, there is a ventral hernia. Palpating through this opening, there is found, at the usual site of the appendix, a hard mass, size of a walnut. Operation, January 10, 1899. Intestines and omentum matted together and covered with a serous exudate. Several large, hard masses felt in the posterior part of the abdomen, which proved to be retroperitoneal glands. The glands throughout the mesentery were enlarged and hard. Several of these were excised for examination. The appendix was separated from adherent intestines with much difficulty. It was short, thick, and gave evidences of chronic inflammation. The fluid from this region had a foul odor. Appendix removed. Incision closed with drainage.

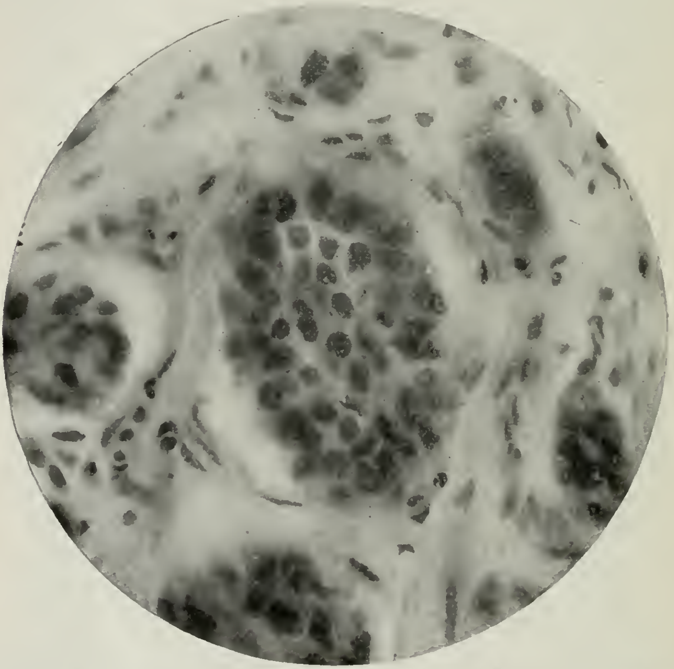

Fig. 6.—Spheroidal-cell carcinoma of the appendix (Case XXVII), showing alveoli filled with irregularly ovoid or polyhedral cells.

Pathological number, 4239. October 1, 1899. Appendix and glands. In some parts of some sections there is a cancerous structure. Some alveoli are round and have a lumen, others are round and packed with cells, others are long and narrow, in places only a single row of cells. Some of the alveoli lie in smooth muscle. There is some inflammatory exudation at the surface of some portions. The lymph glands look normal. After-history: This patient was seen in March, 1908, and was in perfect health. There is a symptomless ventral hernia in the scar but nothing abnormal is palpable in the iliac fossa. There has been, consequently, no recurrence after nine years.

Fortunately the slides were preserved. I submitted them to Dr. Wood, of Columbia University, on February 20, 1908, for the purpose of obtaining a photomicrograph, which is here reproduced (Fig. 6). His pathological report is as follows: The specimen consists of three mounted sections of a portion of the intestinal tract. From the thickness of the wall and the fact that there are four or five small gland tubules embedded in the lymphoid tissue, in one portion of one section, it is probable that the material was removed from the appendix. The muscular coats are arranged in a circular and longitudinal group, and scattered irregularly between the muscle bundles are alveoli filled with irregularly ovoid or polyhedral cells, with large nuclei containing well-marked chromatin. In other portions there is a diffuse infiltration of the muscle tissue with similar cells. At no place has the growth assumed an alveolar type. There are no mitoses visible in the cells. There is only very slight inflammatory reaction around the alveoli containing the cells of the newgrowth. There is no evidence of chronic inflammation of other portions of the tissue. The diagnosis is spheroidal-celled carcinoma of the appendix; whether primary in the appendix or not, it is impossible to say from the sections.[2]

CASE XXVI.—Operator Dr. J. Wiener. A male, aged thirty-five years, was admitted to Mt. Sinai Hospital, New York, December 8, 1903. As a child, inflammation of bowels. Five years ago, indigestion for six months with nausea and belching of gas, appetite fair, but with no pain. One year ago, nervous prostration, which kept him from work for six months. Moderate smoker, but not alcoholic. Eleven days before admission, sudden sharp, shooting pains in right lower quadrant. Next morning went to business, but about 11 A.M. felt nauseated, with chilly sensations and profuse sweating. Severe umbilical pains. A few hours later, temperature 103.6°. No vomiting. Bowels moved spontaneously. Went to bed and had fever and chilly sensations for three days, when the pain became localized in the right iliac fossa. Operation December 9, 1903, at which time nothing palpable in the right iliac fossa was felt, but there was slight tenderness on deep pressure in that region. Intermuscular incision. Many dense adhesions between cecum, parietal peritoneum, and ileum. Appendix firmly adherent below and internally to cecum. Separation of adhesions caused tearing of serosa of cecum in several places, which were repaired with silk sutures. Appendix two inches long, very narrow, especially at base;

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[2] That it was primary in the appendix is proved by the material removed at the operation and by the non-recurrence after nine years.

near its tip and projecting into the meso-appendix was what was taken to be a small gland. In the mesentery, near the ileocecal junction, a large gland was found and removed. This gland, together with the tip of the appendix was submitted to the pathologist, Dr. Mandlebaum. Out of bed on the tenth day, and the wound healed in two weeks. The diagnosis is adenocarcinoma near tip of the appendix; obliterating appendicitis; hyperplasia of mesenteric gland. The patient was well four years later, that is, at the present time.

In connection with these cases, I have gone over the literature and have collected all the reported cases of primary carcinoma of the appendix that I could find after an exhaustive search. In 1906 Rolleston and Jones published a report of 42 cases of malignant tumors primary in the appendix, all doubtful cases having been excluded. Since Rolleston's paper, no collection of such cases has appeared in English. I have found 48 cases in all, which, in addition to those of Rolleston, make a total of 90 undoubted cases. No case in which the tumor has been found involving the cecum, even to the slightest degree, has been included in either series, because in such cases it is impossible to say where the cancer originated, whether in the cecum or in the appendix.

The following is a list of 48 cases. The number before each case refers to the corresponding references throughout this article:

I. Landau. Berl. klin. Woch., December 10, 1906.

II. Villar. Gaz. hebdom. des Soc. méd. de Bordeaux, January 3, 1904, p. 3.

III. Weinberg. Bull. et mém. de la Soc. anat. de Paris, 1905, No. 3, p. 38.

IV. Baldauf. Albany Medical Annals, December, 1905.

V. Baldauf. Ibid.

VI. Baldauf. Ibid.

VII. Warthin. Physician and Surgeon, Detroit, December, 1906, p. 544.

VIII. Eccles. Amer. Jour. Med. Sci., June, 1906, p. 966.

IX. Fauldner. Lancet, 1906, i, 598.

X. Brandts. Münch. med. Woch., 1907, September 3, p. 1780.

XI. Brandts. Ibid.

XII. Driessen. Beiträge zur klin. Chir., 1907, liv, 252.

XIII. Lejars. Bull. et mém. de la Soc. de Chir. de Paris, March 12, 1907.

XIV. Zaaijer. Beiträge zur klin. Chir., liv, 308 (No. 1 of his cases).

XV. Zaaijer. Ibid. (No. 2 of his cases).

XVI. Zaaijer. Ibid. (No. 3 of his cases).

XVII. Zaaijer. Ibid. (No. 4 of his cases).

XVIII. Kaufmann. Spec. patholog. Anat., 1904, 3d edition, p. 464. Case 1.

XIX. Kaufmann. Ibid. Case 2.

XX. Jong. Mitt. aus d. Grenzg der Med. und Chir., 1907, xviii, Nr. 3.

XXI. Hessberg. Carcinoma Processus Vermiformis, Inaug. Diss., München, 1904.

XXII. McWilliams. This article, p. 822.

XXIII. Zaaijer. Same reference as Cases 14, 15, 16, 17 (his Case No. 5).

XXIV. Zaaijer. Ibid. (his Case No. 6).

XXV. Zaaijer. Ibid. (his Case No. 7).

XXVI. Wiener. This article. Not previously published, p. 829.

XXVII. McCosh. Ibid, p. 827.

XXVIII. Barrow. Georgia Practician, February 15, 1905.

XXIX. Pauchet. Gazette médicale de Picardie, 1900, xviii, 146.

XXX. Nélaton. Bull. et mém. de Soc. de chir. de Paris, March 12, 1907, p. 228

XXXI. Hartmann. Ibid., March 5, 1907, Case 1.

XXXII. Hartmann. Ibid., Case 2.

XXXIII. Mason and Rhea. Boston Med. and Surg. Jour., January 10, 1907, p. 44.
XXXIV. Grunbaum. Berl. klin. Woch., August 5, 1907, Nr. 31, p. 984.
XXXV. Patel. Lyon médical, 1907, cix, 276.
XXXVI. Cullingworth and Corner. Lancet, 1904, ii, 1340.
XXXVII. Neri. Beiträge zur path. Anat., 1905, xxxvii, 163.
XXXVIII. de Bovis. Revue de Chir., 1900, p. 708.
XXXIX. Deaver. Amer. Jour. Med. Sci., 1906, p. 845.
XL. Deaver. Ibid.
XLI. Becker. Münch. med. Woch., July 10, 1906, Nr. 28, p. 1383.
XLII. Grieg. Lancet, 1907, ii, 1466.
XLIII. Mandlebaum. Proc. New York Path Soc., 1905.
XLIV. Mandlebaum. Ibid.
XLV. Korte. Verhand. der Deut. Gesell. f. Chir., 1905, xxxiv.
XLVI. Korte. Ibid.
XLVII. Korte. Ibid.
XLVIII. Libmann. Proc. New York Path. Soc., 1906, No. 6.

I have excluded the following cases because they have either not seemed to be positively cancerous appendices or else not undoubtedly primary in the appendix:

De Ruyter. Archiv. f. klin. Chir., Band lxix, p. 281.
Edington. Glasgow Med. Jour., l, 120.
Meyerstein. Carcinoma Append. Vermiformis, Inaug. Diss., München, 1905.
Martin. Trans. South. Med. and Surg. Assoc., xvii.
Westerman. Beiträge zur klin. Chir., 1907, liv, 258.
Sudsuki. Three cases of "lymphangitis plastica," Mitt. aus den Grenzg. der Med. und Chir. 1901, vii, 516.

The results of the study of these 48 cases are given in the following pages. In many instances they will be found combined with the statistics of Rolleston, in order that certain facts may be more authoritatively established. In no region of the body are we able to obtain cancers in such an early stage of their development as those occurring primarily in the vermiform appendix, and their careful study should in future elicit new and important information with regard to many points in the life history of malignant neoplasms. Consequently, every case should be accurately observed and reported. Now that attention has been drawn to its occurrence so frequently, it can no longer be considered a curiosity.

Reasons which Led to the Removal of the Appendix. Of the 48 cases in this series, details are wanting as to this point in 3. Of the 45 remaining cases, 2 appendices were removed at autopsies for other conditions, namely, Case XVIII (Kaufmann), in which the distally enlarged appendix was removed from the body of woman, aged thirty-one years, who had died in the fourth week of typhoid; and second, Case XXI (Hessberg), in which the primary cancer was found in the appendix of a woman, aged seventy-six years, who had died of general miliary tuberculosis and arteriosclerosis; 36 of the remaining 43 patients suffered from some variety of appendicitis. In Rolleston's series of 33 patients who were operated upon, 27 had symptoms pointing to appendicitis in some form. Thus, out of a total of 76 patients operated upon, 63 (83 per cent.) had had such symptoms. Following the latter's classification, I shall divide these as follows:

1. Symptoms of the first acute attack, operation during or immediately after the first acute attack:
McWilliams, 13 (Cases 4, 6, 22, 24, 26, 29, 30, 31, 34, 45, 47, 48, 49).
Rolleston, 10
—
Total, 23, or 36.5 per cent.

2. Chronic symptoms without acute attack:
McWilliams, 8 (Cases 15, 16, 17, 19, 20, 36, 37, 42).
Rolleston, 5
—
Total, 13

3. Chronic with one or more acute attacks:
McWilliams, 2 (Cases 14, 25).
Rolleston, 3
—
Total, 5

4. Recurrent attacks:
McWilliams:
Two attacks, 5 (Cases 3, 10, 13, 23, 28).
Three attacks, 5 (Cases 5, 8, 9, 12, 44).
Five attacks, 3 (Cases 2, 32, 27).
—
Total, 13
Rolleston, 9
—
Total. 22

From these figures we find that of the 63 patients with some variety of appendicitis, 23 (36.5 per cent.) had their appendices removed during or immediately after the first acute attack. In these cases it would seem more than likely that the growth was the cause of the acute inflammations, acting in a manner similar to a concretion. For the growth may occlude the lumen, causing stagnation of material beyond the tumor, with the resulting changes in the mucous membrane, allowing the entrance of micro-organisms, or the same condition may be brought about by ulceration of the surface of the tumor, or its breaking down through lack of nutrition, due to obliteration or compression of the bloodvessels. The question then immediately comes up, What causes the growth itself? This will be discussed later.

Forty patients, or 63.5 per cent., had had symptoms of chronic appendicitis in some form for varying periods of time. Of these, 17 are to be found in Rolleston's series, and 23 in my own. I have been able from the imperfect records to ascertain the duration of the symptoms in the following cases:

12 years,	2	cases,	Jones and Simmons, Zaaijer.
7 "	2	"	Weinberg, Kelly and Hurdon.
5 "	1	"	Neri.
4 "	2	"	Hartmann, Jong.
3 "	4	"	Moschkowitz, Driessen, Zaaijer, Villar.
2 "	5	"	Weir, Burnham, Kaufmann, Zaaijer, Mandlebaum, McCosh.
1 "	4	"	Battle, Barrow, Deaver, Eccles.
Many yrs.,	1	"	Kaufmann.
9 months,	1	"	Landau.
7 "	1	"	Baldauf.
3 "	2	"	Lejars, Zaaijer.
2 "	1	"	Cullingworth and Corner.
	26	cases.	

These figures show that symptoms existed for over a year in 21 patients (more than 28 per cent.). This lends weight to the theory that chronic inflammatory changes are the cause of malignancy.

It would be interesting to inquire, then, in this connection, how many of these appendices, removed from patients with chronic symptoms associated with cancer, showed the microscopical lesions of chronic inflammation? There were 23 patients in my series with chronic symptoms, and associated chronic lesions were found by the microscope in the following cases: Baldauf (V), Eccles (VIII), Brandts (X), Driessen (XII), Zaaijer (XIV), Zaaijer (XV), Zaaijer (XVII), Zaaijer (XXV), Deaver (XXXIX), Hartmann (XXXII), Neri (XXXVII), Barrow (XXVIII), Weinberg (III), Mandlebaum (XLIV), Hessberg (XXI), Zaaijer (XXIII), McCosh (XXVII).

Thus, out of 23 cancerous appendices removed for chronic symptoms, in 16 (70 per cent.) it is definitely stated that chronic inflammatory lesions were present in addition to the cancers. In the remaining 7 of the 23 cases, the descriptions of the microscopic findings were either too meagre or too indefinite to judge as to this point.

Are we able to find with the microscope chronic lesions in the cancerous appendices removed from patients in the first acute attack? In my own series of 13 acute cases, I found with regard to this question the following to be the facts:

Case	IV.	Baldauf.	Chronic lesions were stated to be present.
"	VI.	Baldauf.	" " " "
"	XXII.	McWilliams.	" " " "
"	XXIV.	Zaaijer.	" " " "
"	XXIX.	Pauchet.	Not mentioned in record.
"	XXXI.	Hartmann.	" " "
"	XXXIV.	Grunbaum.	" " "
"	XLVII.	Korte.	" " "
"	XLVIII.	Korte.	" " "
"	XLIX.	Libman.	Chronic lesions present.
"	XLV.	Mandlebaum.	" " "
"	XXX.	Nélaton.	" " "
"	XXVI.	Wiener.	" " "

Of these 13 cases, in which cancers were found in appendices removed in the first acute attack, there are 8 (61 per cent.) in which mention is made of chronic inflammatory lesions being found in addition to the cancers.

In 7 of the 48 cases the primary cancerous appendix was removed in the course of other operations:

Case I. Landau. Myomectomy; left salpingoöphorectomy; appendix removed because of bulbous tip. Chronic lesions also present. Female, aged thirty-three years.

Case VII. Warthin. Acute pelvic abscess, due to pyosalpinx; right salpingoöphorectomy; appendix removed because irregularly thickened. Chronic lesions found with the microscope. Female, aged thirty-two years.

Case XI. Brandts. Symptoms before operation thought to be due to biliary calculi, because of jaundice and recurring pains. Cholecystectomy. Appendix clubbed. Chronic lesions present in appendix. The author says that the "attacks were due to chronic appendicitis caused by the cancer." Male, aged thirty-five years.

Case XX. Jong. Patient had diarrhœal attacks for four years, which were referred to a chronic appendicitis. Removal of the appendix cured the attacks. Appendix found to have a very thick proximal mucous membrane and a stenosis, 2.5 cm. from the tip, which caused a cyst in tip with thick walls. In the appendix, chronic lesions found generally and a cancer in the cyst. Female, aged forty-seven years.

Case XXXIII. Mason and Rhea. In 1903, cyst of ovary removed. In 1905, resection of the tube and ovary for cyst and hydrosalpinx. In 1906, operation for subacute pelvic pains, curettage, ventrosuspension, resection of ovary, and removal of normally appearing appendix, "to prevent any possible further trouble." Chronic lesions present, as well as a small cancer in the tip, only visible by means of the microscope. Female, aged twenty years.

Case XXXV. Patel. Operation for double inguinal herniæ. The right one was tender and irreducible, and contained an adherent appendix. No mention in the record of any lesion except the cancer. Male, aged fifty-eight years.

Case XXXVI. Cullingworth and Corner. Fibromyoma of uterus removed. Appendix amputated because of bulbous tip. Chronic lesions also present. Female, aged thirty-one years.

In these 7 cases the cancerous appendices were chance findings. The average age of these patients was 36.5 years. Rolleston gives 4 such patients, all operated upon for pelvic lesions.

Summarizing, then, the presence or absence of chronic lesions in my series of 48 cases, I find the following to be the facts:

Among the 23 patients operated upon for chronic appendicitis, 16 were stated to have chronic lesions present, as found by the microscope. Of the 13 patients operated upon for acute appendicitis, 8 were definitely stated also to have chronic lesions present. In 6 of the 7 patients from whom the appendices were removed in the course of other operations, chronic lesions were found. Thus, there was a total of 30 patients out of 48, or 62 per cent., in whose cancerous appendices associated chronic lesions were found by the microscope. Which is primary, the chronic inflammation or the cancer? As yet, there is no correct answer to this question apparently. We may summarize, then, the reasons for the discoveries of the cancers as follows:

	McWilliams.	*Rolleston.*	*Totals.*
Acute appendicitis	13	10	23
Chronic appendicitis	23	17	40
Appendices removed in the course of pelvic operations	4	4	8
Iliac fistulæ	0	2	2
Inguinal hernia	1 (Case 35)	0	1
Appendectomy and cholecystectomy	1 (Case 11)	0	1
Appendectomy for chronic diarrhœa	1 (Case 20)	0	1
Autopsies	2	8	10
Unknown	3	1	4
Totals	48	42	90

FREQUENCY OF OCCURRENCE OF PRIMARY CARCINOMA OF THE APPENDIX. This is difficult to ascertain statistically, because in most of the published reports of series of cases, in which the appendices were removed for some reason or another, there is not given the number of appendices which were examined systematically by the microscope; only such cases ought to be included in figures designed to show the relative frequency of primary cancers in removed appendices, because in a large number of cases in my series the tumors were not found except when sections had been examined under the microscope. Many of the appendices containing the cancers were considered at the time of the operations, when viewed macroscopically, to be tuberculous or to be merely the seat of simple cicatrices. The following are reported series of cases with the number of cancerous appendices in each; it is not mentioned in reports just how many of the appendices were examined microscopically:

Baldauf	6 cancers in	735 appendices.
Neri	1 cancer in	82 "
Elting	2 cancers in	320 "
Jong	1 cancer in	255 "
Schrumpf	1 cancer in	150 "
Moschkowitz	6 cancers in	2000 cases.
Zaaijer	4 cancers in	463 "
Kelly (Deaver's cases)	5 cancers in	2500 appendices.[3]
Total	26 cancers in	6505 appendices, or 0.4 per cent.

This frequency of cancer of the appendix differs radically from the conclusions of Baldauf and of Zaaijer, who maintain that such tumors occur in 1 per cent. of the cases of appendicitis. Their figures are based, however, on a much smaller number of cases than are mine. From my series above, this percentage of Baldauf is altogether too large. It is impossible to judge from the tabulated reports of the above-mentioned authors in what proportion of the cases microscopic examination of the appendices was made. Had such been made in all cases, it is not to be questioned that additional carcinomas would have been found. Until a large number of appendices are examined critically with the microscope, it will be impossible to ascertain correctly just what the true frequency of primary cancer of the appendix is. It is more than likely that many of the cases of cancer of the cecum are due to secondary extensions from a primary growth in the appendix. I have not included any such cases in my statistics.

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[3] Personal communication from Dr. A. O. J. Kelly. Microscopic examinations were made of all these 2500 appendices. Not included are two cases of endothelioma.

AGE. In 42 of my series of 48 cases the ages are known, and are as follows:

	McWilliams.	*Rolleston.*	*Total.*	*Per cent.*
Between 1 and 10 years	2 cases	0	2	3
" 10 " 20 "	9 "	7	16	20
" 20 " 30 "	16 "	13	29	37
" 30 " 40 "	10 "	7	17	22
" 40 " 50 "	1 case	5	6	8
" 50 " 60 "	1 "	2	3	4
" 60 " 70 "	1 "	1	2	3
" 70 " 80 "	1 "	0	1	1
" 80 " 90 "	..	1	1	1
Total	42 cases	36	78	99

Average age 27.7 years.

There were 2 patients aged eight years (Cases VI and X), 1 aged twelve (Case XXIV), 1 aged fifteen (Case XLIX). The oldest patient in my series was aged seventy-six years. It will thus be seen that 27 of the 42 cases, or 66 per cent., of primary cancer of the appendix in my series occurred before the age of thirty. The combined statistics of Rolleston and mine give 47 out of 78 cases, or 60 per cent., as occurring before thirty. The average age in the combined statistics is twenty-nine years.

This is in striking contrast to the age incidence in malignant tumors of the remainder of the intestinal canal. Thus, Rolleston gives, in 41 cases of primary cancers of the duodenum, the average age as fifty-two years; in 9 cases of primary carcinoma of the jejunum and ileum it was 47.2 years; in 30 cases of primary carcinoma of the cecum, 47.8 years; and in 100 cases of primary carcinoma of the remainder of the large intestine, 49.34 years. Thus, we find in 180 cases of cancers of the intestinal canal, exclusive of the appendix, the average age is forty-nine years; while in 77 cases of primary cancers of the appendix the average age is twenty-nine years, which shows that the average age incidence in primary cancer of the appendix is twenty years less than in other parts of the intestine.

Mandlebaum reports that among 96 cases of primary cancer of the intestine occurring in the Mt. Sinai Hospital, New York, 5 were primary in the appendix, or 5.2 per cent. These cases constituted 0.75 per cent. of cancers from all sources. These are undoubtedly very high percentages of frequency, and cannot be accepted as generally typical.

From these statistics it seems that the age incidence of primary cancer of the appendix corresponds somewhat closely to that of simple appendicitis. Thus, Deaver, in 3000 cases of ordinary appendicitis, found the following to be the age percentages (I add the percentages in the cancer cases as contrast):

	Simple appendicitis.	*Cancer of appendix.*
From 10 to 20 years	27.5 } or 69 p. c.	23.0 } or 60 p. c.
" 21 to 30 "	41.5 } before 30	37.1 } before 30
" 31 to 40 "	20.1	21.8
" 41 to 50 "	7.0	7.6
" 51 to 60 "	2.8	3.8
" 61 to 70 "	0.6	2.5
" 70 to 80 "	..	1.2
" 80 to 90 "	..	1.2

SEX. These were divided as follows:

	McWilliams.	*Rolleston.*	*Total.*	*Per cent.*
Females	24	20	44	57.1
Males	17	16	33	42.8

From these figures it appears that the disease occurs more frequently in women than in men, the difference in frequency being 15 per cent. in favor of the female sex. It has been suggested that this may be due to the more frequent performance of laparotomy in women than in men. In addition, the proximity of the appendix to the female generative organs, with the possibility of extension to the appendix of irritation induced by inflammation of these organs, may have something to do with its greater frequency among women. Thus, in the 7 cases in my series in which cancerous appendices were removed in the course of other operations, 5 of these occurred in women, 4 of whom were operated upon for pelvic conditions. In Rolleston's 6 cases, operated upon for conditions other than appendicitis, 4 were for pelvic lesions. In a total, then, in Rolleston's and my own series of 13 operations, in course of which the appendices were removed, 8 were upon the female pelvic organs. This brings up the moot question, whether it would not be the part of wisdom in all cases to remove the appendix when one is operating in its vicinity.

Deaver found, in 3000 cases of ordinary simple inflammations of the appendix, that 62 per cent. occurred in men and 38 per cent. in women. Many authorities maintain that ordinary inflammation in the appendix is the exciting cause of the development of primary cancers in them. If such ordinary inflammations occur in 62 per cent. of the cases in men and 38 per cent. in women, we should naturally expect that these primary cancers of the appendix would be more frequent in men; but the very reverse is the case, for 57 per cent. of primary cancers of the appendix occur in women and 42 per cent. in men. What is the reason for this reversal of frequency in the two sexes in the two affections? At present there seems to be no explanation whatsoever that adequately answers this question; we must simply accept it as a fact, to be confirmed or rejected, as the case may be, later by a larger number of cases.

Concretions. These were mentioned as being present in only 2 cases (X and XXXV). Rolleston found in his series of 42 cases that calculi were present in 3 cases. This makes a total of 5 cases out of 90, or 5.5 per cent. From this we may infer that concretions form a very small role, if any, in the etiology of cancers of the appendix, which is in striking contrast to the frequency with which calculi in the gall-bladder are found associated with primary cancer in that organ.

In only 1 recorded case of primary cancer of the appendix is there mention of a foreign body (other than coprolith) having been found. This is Case XXXV (Patel), in which a cancer and a small fishbone were found in an appendix in an inguinal hernia.

The great rarity (5 per cent.) of fecal concretions in appendices containing primary cancers is in striking contrast to the frequency with which these bodies (not including other foreign bodies) are met with in operations for the removal of the appendix for ordinary inflammatory conditions. Thus, I have collected the following statistics with regard to the frequency of fecal concretions in ordinary appendicitis:

	Cases.	*Fecal concretions.*
Fitz	300	15
Ranvier	459	179
Murphy	141	43
Deaver	460	74
Schuylenburch	271	36
Hawkes	66	8
Hagen	184	21
Nordman (Korte)	1522	608
Total	3403	984 (or 28.2 per cent.)

Enlarged Glands. These were mentioned as being present at the time of the operation in only 5 of the cases in my series, or 10 per cent., namely, Cases I (Landau), VIII (Eccles), XXVIII (Barrow), XXVI (Wiener), XXVII (McCosh).

In Eccles' case there were two small glands in the meso-appendix, which, unfortunately, were not examined microscopically. The later history of this patient is not given. In Barrow's case the mesentery of the ileum, cecum, and part of the ascending colon contained ten or more, both palpably and visibly enlarged glands, one or two of them being as large as an adult thumb. They were deemed tuberculous at the time of the operation, being considered, erroneously, secondary to tuberculosis of the appendix. There was no microscopic examination of these glands. This patient is well at the present time, four years after the operation. In Landau's case the meso-appendix contained one pea-sized gland, which, on microscopic examination, was found to be free from cancer. The later history of this patient is not given. In Wiener's case (XXVI) a large gland was removed from the mesentery near the ileocecal junction. Microscopic examination showed that it was free from cancer and was merely hyperplastic. This patient was well four years after the operation. In McCosh's case (XXVII), there were many large glands present, but the microscope proved these to be uninvolved by cancer. This patient was perfectly well nine years after the appendectomy.

In 2 cases in my series, Hartmann (XXXI), Baldauf (IV), there were small masses in the meso-appendix which at the time of the operations were considered to be enlarged glands, but which later, on microscopic examination, were found to be metastatic cancerous masses, secondary to the cancers in the appendices, and were not cancerous glands.

In Rolleston's series of cases there were 3 patients in whom the abdominal lymphatic glands were enlarged (the cases of Fiske-Jones and Simmons, Beger, and A. O. J. Kelly). In the case of Fiske-Jones and Simmons, it was found by the microscope that the enlarged mesenteric glands were unaffected with cancer. The patient was well seven months after the operation. Beger's case did not survive the attempt to remove an iliac sinus, due to a cancerous appendix, which had existed for three and a half years. The fistula was found to lead directly into the appendix, which was infiltrated throughout by carcinoma, the growth projecting into the cavity of the cecum, but not actually involving its walls. On post-mortem examination, the retroperitoneal glands were found to have become implicated, but there was no suggestion that the growth in the appendix was other than primary. In the case of A. O. J. Kelly, the peritoneum was studded with very small grayish nodules which suggested miliary tubercles. The patient died on the sixth day as the result of an operation to replace protruding intestines. At the time of the primary operation the retroperitoneal glands were found enlarged (apparently these were not examined microscopically).

Thus, out of 90 cases, only 8 had enlarged glands, or 9 per cent. Of these, in 4 cases the microscope showed that the enlarged glands were not implicated with cancer. In 3 cases the enlarged glands were not examined microscopically. In only one case (1 per cent.) was it positively demonstrated that the glands were cancerous. Hence we must infer that these cancers of the appendix are exceedingly slow in involving the lymphatics. As will be shown later, however, they do spread into the meso-appendix by direct continuity.

Situation of the Tumors. In 38 of the 48 cases in my series this is found to be as follows (10 of the records are defective in this regard); Rolleston's series of 33 cases is also added:

	McWilliams.	*Rolleston.*	*Total.*	*Per cent.*
At or near the tip	26	16	42	59.15
In the middle	6	4	10	14.08
Near the base	2	8	10	14.08
At the middle and tip	1	1	2	2.81
Near the base and middle	1	0	1	1.40
Almost the whole appendix	2	4	6	8.44
Total	38	33	71	

From these figures we find that in over 59 per cent. of the cases the tumors were situated at or near the tip, and in 76 per cent. they were located at or distal to the middle. These are striking facts, since it indicates that primary cancers of the appendix develop in the regions where strictures, obliterations of the tip, and chronic inflammatory tissues occur most commonly. One can consequently scarcely refrain from arguing that there may be an etiological connection between these processes and the tumors. Such a relationship is further suggested by finding with the microscope that these cancers often develop directly in these pathological tissues, from which we may possibly infer that the cancer is a new implantation on a prepared ground. These regions, the seats of predilection for cancers, are likewise most exposed to nutritional changes, due to malpositions and twistings, all of which conduce to decadence of tissues.

When all is said that can be said in favor of the view that the chronic inflammation is the precursor and cause of the development of the cancers, no one can deny that the reverse may be true, namely, that the cancer causes the chronic inflammatory changes. To this latter view, it may be objected that the chronic symptoms have, in many of the instances, existed for so long a period of time, years in some of the cases, as to make the existence of cancer for so long a period improbable. This objection, however, may be met by the statement that these primary cancers of the appendix are more than likely of very slow growth, particularly in the beginning. At present we are not in the position of being able to state positively which is primary, the cancer or the chronic changes in the appendix.

MACROSCOPIC APPEARANCES OF THE APPENDICES. Information is afforded by a perusal of the records as to this point in 42 cases. The analysis shows some interesting results:

1. No tumor was present to the naked eye in 14 cases (33.3 per cent.) of the 42 cases. These were Cases 3, 4, 5, 6, 7, 9, 13, 15, 18, 19, 33, 37, 42, 43.

2. A cyst was present in 3 cases (0.7 per cent.); size (*a*) small, No. 20; (*b*) bean, No. 1; (*c*) large, No. 29 (4 inches long by $2\frac{2}{5}$ wide, with a twisted pedicle).

3. One or more solid tumors were present in 23 cases (55 per cent.). (*a*) Single tumor, 19 cases: size (1) small, 4 cases, Nos. 24, 25, 36, 39; (2) pea, 13 cases, Nos. 2, 10, 12, 14, 16, 21, 22, 23, 26,

30, 31, 44, 49; (3) bean, 2 cases, Nos. 17, 45. (*b*) Two tumors, 3 cases, Nos. 8, 28, 32. (*c*) Numerous tumors, 1 case, No. 35.

4. Clubbed tip only, 2 cases, Nos. 11 and 34.

5. In 9 cases, there were found obliterated areas ("cicatrices"), which later under the microscope were discovered to be cancerous cicatrices. These were Cases 3, 5, 7, 14, 21, 25, 33, 36, 37.

6. In 2 cases ulcers were present, Nos. 4 and 6. In both of these cases cancers were found in the ulcers themselves.

7. Perforations were present in 2 cases, Nos. 10 and 22, and concretions were found in 2 cases, Nos. 10 and 35.

8. Four of the cases, all of which had visible small tumors, were thought at the time of the operation to have tuberculous appendices. These were Cases 8, 10, 28, 31. The microscope alone revealed their true nature.

This analysis is interesting to the operating surgeon, for in only 55 per cent. of the cases were visible tumors present. Many of these tumors, however, could not be seen from the outside, as the growths often projected into the lumen without any external prominences, as was instanced in my own case (XXII). In 14, or 33 per cent., no tumors were visible to the naked eye, even after the appendices had been opened throughout. Three of the appendices, before they were cut open, were erroneously thought to have diverticula as the cause of the prominences at the time of the operations.

From these statistics, then, it is easily seen how fallacious it is to argue that because there is no visible tumor there can be no cancer present; only by careful microscopic examination can possibility of cancer be excluded. Hence the inaccuracy of any statistics based solely on the macroscopic appearances alone of the appendices.

PATHOLOGICAL CLASSIFICATION OF THE TUMORS. This is a somewhat difficult task, by reason of the different aspects in which this part of the theme has been considered, and on account of the use of a widely varying nomenclature by the authors. I have been assisted in this division by Dr. F. C. Wood, of the Pathological Department of Columbia University, New York, to whom my thanks are due for the assistance, as well as for the photomicrographs which accompany this article.

The following divisions of the neoplasms have been made, based on the microscopic examinations. There are 71 cases in which such examinations are reported:

1. *Columnar-cell Tumors.* Among these I have also included those which in the records are called adenocancers, cylindrical-cell cancers, and alveolar cancers. There were 14 of this type, or 33 per cent. of the 42 cases in which the variety of cancer was stated in my series of 48 cases. These were Cases 2, 3, 12, 21, 26, 29, 30, 31, 32, 37, 43, 46, 47, 48. The age and sex are stated in 11 cases:

6 females, average age 39.5 years. 1 was 76 and another 63.
5 males, " " 30.5 " 2 were 35.
—
11 average age 35 years.

2. *Spheroidal-cell Cancers.* Among these are included scirrhus cancers, solid globocellular cancers, basal-cell cancers, cancer simplex, polyhedral-cell cancers, carcinoma solidum diffusum, polymorphous-cell, and round-cell cancers. Of these there were 22 cases, or 52.4 per cent. of the 42 cases in my series, in which the variety of neoplasm is stated.

15 females, average age 23.6 years.
7 males, " " 23.4 "
—
22 average age 23 years.

These cases were Nos. 1, 4, 5, 6, 7, 8, 10, 13, 15, 18, 19, 20, 22, 24, 25, 27, 33, 34, 36, 44, 45, 49.

3. *Mixed Types.* Four cases, 1 male, 3 females; average age 29.7 years. (*a*) Scirrhus cancer with intimation of adenocancer, No. 11, male, aged thirty-five years. (*b*) Cancer solidum alveolare, partim solidum diffusum, No. 14, female, aged thirty-five years. (*c*) Partly adenocancer, partly cylindrocellulare solidum, partly carcinoma solidum diffusum, No. 16, female, aged twenty-six years. (*d*) Partly adenomatous, chiefly solid and diffuse, No. 23, female, aged twenty-three years.

4. *Columnar-cell cancer* undergoing spheroidal-cell transformation, 1 case, No. 9, age and sex not given.

5. *Colloid Cancer.* Case No. 17, male, aged twenty-five years.

6. *Endothelioma.* None in my series.

7. "*Cancer*" the only designation. Cases 28, 35, 39, 40, 41, 42. Total, 6 cases. In only 3 of these 6 cases are the ages and sex given. There were 2 males with an average age of thirty-eight years and 1 female of seventeen years.

COMBINED STATISTICS.

	McWilliams.	*Rolleston.*	*Totals.*	*Per cent.*	*Average age.*
Columnar-cell cancers	11	5	16	22.5	43.5
Spheroidal-cell cancers	22	16	38	53.5	23.5
Transitional cancers	1	6	7	9.8	32.7
Mixed cancers	4	0	4	5.6	29.7
Colloid cancers	1	2	3	4.2	
Endotheliomas	0	3	3	4.2	
Total	39	32	71		32.3

From these statistics we see that the spheroidal-cell cancers are 30 per cent. more frequent than the columnar-cell types. There is also a difference of twenty years in the average age incidence in the two varieties of cancer, the average age in the spheroidal-cell cancers being twenty-three years and in the columnar-cell type forty-three years.

If we compare the frequency of these various types of cancer in the remaining portions of the alimentary canal, we find the following to be the case in this regard:

Petersen and Colmers:
Large intestine:

	Per cent.
Adenocancer	86.5
Spheroidal cell	13.5

Kappers and Van Rooyen:
Stomach and intestines:

	Per cent.
Adenocancer	56.6
Mixed forms	13.2
Spheroidal cell	20.7
Colloid	9.5
Intestines alone:	
Adeno-cancer	72.7

If we compare these figures with those showing the frequency of the different types in appendical cancers, we have a striking contrast.

	Stomach with intestines. Per cent.	*Large intestine. Per cent.*	*Intestines alone. Per cent.*	*Appendical cancers. Per cent.*
Adenocancers	56.6	86.5	72.7	22.5
Spheroidal-cell cancers	20.7	13.5	..	53.5
Colloid cancers	9.5	..	..	4.2
Mixed cancers	13.2	..	..	5.6

Hence we see that in the appendical cancers, the columnar-cell or adenomatous cancers occur in about one-quarter of the cases only, while in the direct intestinal tract this type of cancer is the rule, occurring in almost three-quarters of the patients. In the stomach and intestines taken together, the spheroidal-cell cancer is found in only one-fifth of the cases, while in the appendix this type of cancer is found in over one-half of the cases. Colloid cancers of the appendix seem to be rarer than in the other portions of the intestinal tract.

What the significance of these observations is I do not pretend to be able to state or even to speculate about.

A rather striking similarity between the frequency of the occurrence of the various forms of the stomach and appendical cancers is shown when we compare the statistics on this point of 115 cases of stomach cancer reported by Fenwick and the 71 cases of appendical cancers in my series:

	Stomach cancer. Per cent.	*Appendical cancer. Per cent.*
Columnar-cell	28.6	22.5
Spheroidal-cell	63.3	53.5
Colloid cancer	7.8	4.2

Microscopic Extent of the Growths. Of the 48 cases in my series, there are records regarding this point in 31 cases, as follows: The neoplasm extended through the mucosa and submucosa alone in 4 cases, or 12.7 per cent., Cases 6, 12, 30, 37. Through the mucosa, submucosa, and muscularis only in 8 cases, or 25.8 per cent., Cases 10, 14, 15, 18, 22, 24, 29, 32. Through the mucosa, submucosa, muscularis, and subserosa in 4 cases, or 12.7 per cent., Cases 5, 11, 17, 33. Through all coats without involvement of the meso-appendix in 8 cases, or 25.8 per cent., Cases 1, 7, 19, 20, 21, 25, 27, 34. Through all the coats with involvement of the meso-appendix in 7 cases, or 22.5 per cent., Cases 3, 4, 13, 16, 23, 28, 31.

From these statistics, then, we find that these appendical neoplasms, when viewed histologically, have a malignant character, showing a tendency to infiltrate progressively contiguous structures (15 cases out of 31, or 48.4 per cent., involving all the coats of the appendices), but without, however, evincing evidences of producing distant metastases or of affecting neighboring lymphatic glands. This invading characteristic is evidently of slow progress, fortunately for the patients. This slow growth is further evidenced by the scarcity of mitotic figures in the sections. In no case are they mentioned as being abundant, the usual designation being "very few."

The malignancy of any tumor is to be judged rather from a clinical than a histological standpoint. Thus we find that rodent ulcer when viewed from a microscopic aspect is a typical carcinoma, and that epulis is a typical sarcoma, yet each clinically has repeatedly been proved to be a fairly benign tumor. The question, then, which particularly interests the operating surgeon is what is the ultimate fate of the patients from whom primary cancers of the appendix have been removed?

Duration of Reported Cures. The after-histories of a number of the patients have been recorded, and the durations of the cures in the following instances are given:

Well after	9 years,	2 cases,	Jalaguier, McCosh.
" "	5½ "	1 case,	Driessen.
" "	5 "	3 cases,	Rolleston, H. Kelly (2 cases).
" "	4 "	3 "	Wiener, Leecne, Fauldner.
" "	3 "	4 "	Wier, Warthin, Cullingworth and Corner, Zaaijer.
" "	2 "	8 "	Moschkowitz, Eccles, Hurdon, Zaaijer, Mandlebaum, Grieg, Jong, Thorndike.
" "	1½ "	4 "	Moschkowitz, Zaaijer (2 cases), McBurney.
" "	1 year,	2 "	Battle, Burnham.
" "	7 months,	2 "	Zaaijer, Jones and Simmons.
" "	6 "	1 case,	Zaaijer.
		30 cases.	

Of the 90 cases in the two series, there were 79 cases operated upon. Of these, 13 were well three years or more after the operations, or 16 per cent., and 21 were well two years or more after the operations, or 26 per cent. Of course, many of the operations were of recent date, and the permanency of the cures is still sub judice.

PROGNOSIS. It is a remarkable fact that primary cancer of the appendix, which microscopically appears to be a malignant growth, is a relatively benign tumor when viewed clinically, since it does not tend to involve the lymphatics nor to form metastases. Recurrences after operation are almost unknown. This apparent benignity seems to be an exception to the rule that the younger the patient with a malignant growth, the more malignant is that growth. This must simply be accepted as a fact without adequate explanation. Cullingworth and Corner, and also Battle, suggest that perhaps the accompanying inflammation destroys the growth, by the sloughing of the offending organ, or the patient dies from peritonitis, or the growth is removed because of the coincident inflammation before dissemination occurs. It must further be remembered that when these growths have become extended, as undoubtedly occurs, they lose all their characteristics as appendical neoplasms, and they are then recognized as cecal cancers only.

In the 79 patients making up the series of Rolleston and my own, who were operated upon, there was only 1 (1.2 per cent.) in which the growth is definitely known to have recurred. This is the case of Lejars. A secondary operation, four months after the first one, showed a cancer of the cecum. The patient succumbed shortly afterward.

An interesting case is related by Lanz[4] of a probable recurrence after operation of a primary cancer of the appendix. It is not included in my series, because there was no microscopic examination of the appendix at the time of the operation. A man, aged forty years, suffered from symptoms of chronic appendicitis. At the operation, the appendix was found adherent and its tip was swollen like a "drumstick." A section of the appendix showed at this latter point a hard tissue mass, which was considered to be a "scar." A recurrence took place, and it was by this only that the true carcinomatous nature of the "scar" was recognized. A similar case is described by De Ruyter,[5] in which at autopsy a carcinoma was found to have developed in the stump of an appendix which had been removed six years previously. This case, for a like reason, is not included in my series.

Secondary growths, including cancerous lymphatics, were recognized as occurring in very few cases. In my own series of 48 cases there were only 2 in which mention is made of any such. These were the patients of Hartmann (XXXI) and Baldauf (IV), in each of which there was a small metastatic cancerous mass in the mesoappendix. In Rolleston's series of 42 cases there were 4 such cases, namely, Beger's patient, in whom the retroperitoneal glands were implicated, the 2 patients of A. O. J. Kelly and of Elting, in both of whom there were multiple growths on the peritoneum, and

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[4] Beiträge zur klin. Chir., 1907, Band liv, p. 261.

[5] Archiv f. klin. Chir., Band lxix, p. 281.

Whipham's patient (autopsy), in which there were growths in the liver and right ovary. Thus, we find that in only 6 cases out of 90 in the combined statistics of Rolleston and myself, or 6 per cent., were there secondary growths. From the analysis of the cases in a preceding paragraph, in which there were enlarged glands at the time of the operations, it is seen that because glands are found enlarged, this is no reason for making a bad prognosis, since the microscope showed that only 1 case had cancerous lymphatics, the remainder being merely affected secondarily by simple inflammation from the appendices. Perhaps we may conclude, from the fact that fewer secondary growths were found in my series of cases than in Rolleston's, that appendices are removed more frequently now than formerly was the case for chronic symptoms, and at an earlier date and for slighter symptoms. By so doing, we undoubtedly will in future save a number of patients from developing cecal cancers, secondary to a primary growth in the appendix.

From the facts thus far deduced, it seems as though we should have to place these primary neoplasms of the appendix in a distinct class by themselves, so far as their malignancy is concerned, allying them somewhat in this regard with rodent ulcer and epulis, and in contradistinction to neoplasms of the alimentary tract generally.

Mortality of the Operations. All the patients in my series recovered after being operated upon, indicating that the presence of a primary appendical cancer does not prejudice the operative prognosis per se.

Surgical Significance of Appendical Cancers. These small neoplasms are not per se to be diagnosticated before operation. The symptoms are those of a simple appendicitis, usually of the chronic, recurrent type. Its age incidence corresponds to that of simple appendicitis. It probably occurs in about 0.4 per cent. of all cases of appendicitis, and this fact, if further confirmed in the future, will more surely cause us to advise appendectomy. The seemingly good prognosis of appendical cancers is more apparent than real, for histologically it has a malignant character with a tendency to involve progressively, though probably slowly, the meso-appendix and the cecum. Whether the cancer is the primary lesion and the appendicitis the secondary, or vice versa, makes absolutely no difference from the patient's standpoint. The main thing for him is to be rid of his cancerous appendix at the earliest possible moment.

Such an appendical cancer will almost always first be discovered by an operation. Benign tumors of the appendix are very rare, hence any circumscribed appendical tumor, found at operation, should always make one suspicious of cancer. In doubtful cases, a frozen section, made during the operation, would be of very great advantage, if possible to obtain; and in case of positive findings, a wide excision of the meso-appendix and removal of the lymphatic glands should be practised. If the tumor be situated in the base of the appendix, it would be best to excise part of the cecum, otherwise this would not seem ordinarily to be a necessary procedure. As a frozen section at the time of the operation will rarely be available, it would be the part of wisdom to make a practice of removing habitually the entire meso-appendix in every operation for appendicitis, as this would not increase materially the risk to the patient under ordinary conditions. This practice is rendered advisable, first, because these tumors, even when very small, have a pronounced tendency to invade the meso-appendix; and second, because they frequently are invisible to the naked eye. Every removed appendix should be subjected to a careful microscopic examination.

When operating in the neighborhood of the appendix for reasons other than appendicitis, the appendix should be inspected carefully. If it has an irregular outline, or is clubbed at its extremity, or constricted, or presents a prominence on its surface, it should unhesitatingly be removed. I shall not go into the more debatable question of whether, in operations generally, the appendices should be routinely amputated in the absence of any visible abnormality. It seems, however, advisable to do so provided no extra risk would be incurred, since the appendix is such a potential factor for future harm for the patient in many directions. The practice of removing the appendix close to its junction with the meso-appendix should be deprecated.

Resume. 1. Of the 76 patients operated upon for known reasons, 63 (83 per cent.) suffered from some variety of appendicitis. Of these, 23 (36 per cent.) were operated upon during or immediately after the first acute attack, while 40 patients (63 per cent.) had had symptoms of chronic appendicitis for varying periods of time. Of the entire 79 operated patients, 28 per cent. had had such chronic symptoms for a year or more. Eleven primary cancers of the appendix were found in appendices removed in the course of operations for other purposes, and were chance findings. In 2 other cases the operations were undertaken for the cure of iliac fistulæ. Ten primary cancers of the appendix were found in the course of autopsies.

2. In 78 cases in which the ages are recorded, it is found that there are 47 patients (60 per cent.) whose age was under thirty years. This age incidence corresponds very closely to that of ordinary inflammatory appendicitis, in which, in 3000 cases, 69 per cent. occurred before thirty years.

3. In 77 cases of primary cancer of the appendix in which the sex is recorded, we find that there were 44 females (57 per cent.) and 33 males (42 per cent.). In 3000 cases of simple, inflammatory appendicitis, 62 per cent. occurred in men and 38 per cent. in women. The reason for this almost complete reversal of frequency

in the two sexes in the two affections remains as yet entirely inexplainable.

4. Concretions apparently form no role in the etiology of primary cancers of the appendix, since in 90 cases they were found only 5 times (5.5 per cent.). This is in sharp contrast to the 984 times fecal concretions were recorded as occurring in 3403 operations for simple, inflammatory appendicitis, or 28 per cent.

5. In 71 cases in which the situation of the tumors was recorded, it is found that in 59 per cent. the neoplasms were located at or near the tip, and in 76 per cent. they were situated at or distal to the middle. This indicates that primary cancers of the appendix develop in the regions where strictures, obliterations of the tip, and chronic inflammatory lesions most commonly occur.

6. Enlarged lymphatic glands were recorded as being present in 8 cases, or 9 per cent. In 4 of these cases, microscopic examinations showed that there was no cancer in them, and in 1 case such secondary cancerous involvement was found. Hence we must infer that these primary cancers of the appendix are exceedingly slow in involving the lymphatics. Three cases are not recorded as having had the enlarged glands examined microscopically.

7. In 42 cases out of my 48 in which it is recorded, no tumors were visible to the naked eye in 14 cases, or 33 per cent. In 23 cases, or 55 per cent., one or more solid tumors were visible. Cysts were present in 3 cases, or 0.7 per cent. Perforations were present in 2 cases. Ulcerations were found in 2 cases. From these statistics it is evident how fallacious it is to argue that because there is no visible tumor, consequently there is no cancer present. Hence the inaccuracy of any statistics based solely on the macroscopic appearances of the appendices.

8. The frequency of occurrence of primary cancer of the appendix is approximately shown in the fact that 26 such cancers were found in 6505 appendices, or 0.4 per cent. This percentage is not absolute, because it is not stated in just what proportion of these cases microscopic examination of the appendices was made; presumably such examinations were made in but a small proportion. In addition, cecal cancers undoubtedly develop from primary appendical cancers, in which case the latter lose all their characteristics as the primary lesion, and are overlooked as such. From all of which we may conclude that a conservative estimate would place the occurrence of primary cancer of the appendix as not lower than 0.4 per cent. of all the appendices removed, or 1 in every 258 appendices examined. Positive proof of this estimate can only be established when a large series of microscopically examined appendices is brought forward.

9. In 71 cases it was possible to make a pathological classification of the neoplasms. Twenty-two per cent. were columnar-cell cancers, 53 per cent. were spheroidal-cell, 9 per cent. were of the

transitional type, and 4 per cent. were colloid cancers. The average age in the spheroidal-cell tumors was twenty-three years and in the columnar-cell type it was forty-three years, a difference in the age incidence in the two varieties of twenty years. Thus, we see that the spheroidal-cell cancers primary in the appendix are 30 per cent. more frequent than the columnar-cell variety. The frequency of occurrence of the two varieties in the appendix is very similar to that in neoplasms of the stomach, while in the intestines alone the columnar-cell type occurs in about 72 per cent. of the cases.

10. Of the 48 cases in my series, there are records regarding the microscopic extent of the growths in the appendices in 31 cases. In 15 cases, or 48 per cent., all the coats of the appendix were invaded, while in 7 cases, or 22 per cent., the meso-appendix in addition was involved in the growth. Thus these neoplasms show a tendency progressively to infiltrate contiguous structures, but without evincing evidences of producing distant metastases. This invading characteristic is probably of slow growth, as is further evidenced by the fact that in all the cases mitotic figures are designated as being very few.

11. Out of 90 patients with primary cancer of the appendix, there were secondary growths present in 6 (6.6 per cent.).

12. In 79 of the patients who were operated upon, the duration of the reported cures is given in 30 instances: 7 patients were well five years or more after the original operations, 13 were in good health three years or more afterward, while 21 showed no signs of any recurrence two years or more after the operations. In only 1 instance out of the 79, or 1.2 per cent., is it definitely stated that the growth recurred. From the facts deduced in this article, it would seem as though these primary tumors of the appendix should be placed in a distinct class by themselves, so far as their malignancy is concerned, allying them somewhat in this regard with rodent ulcer and epulis, and in contradistinction to malignant neoplasms of the alimentary tract generally.

13. The mortality in my series of 46 operations was nil, which indicates that the presence of a primary appendical cancer does not prejudice the operative prognosis per se.

14. The symptoms of these appendical cancers are not sufficiently characteristic to make a diagnosis per se possible without operation.

15. Any circumscribed tumor in an appendix should always arouse suspicions of cancer, following which the meso-appendix should be widely excised and enlarged glands removed. It will be necessary to excise part of the cecum only when the tumor is situated in the base of the appendix.

16. In every appendectomy the entire meso-appendix should be removed if possible.

17. Every removed appendix should be examined microscopically.

18. When operating in the neighborhood of the appendix for reasons other than appendicitis, the appendix should be amputated

in case it presents any abnormality, particularly when its tip is clubbed.

19. In addition to the cancers themselves found in the appendices, in 30 cases out of 48 in my series, or 62 per cent., it is found that chronic inflammatory lesions were discovered by the microscope. Whether the chronic changes are primary and the cancers secondary to these, or vice versa, it seems impossible to decide in the present state of our knowledge of the subject.

Addendum.

Since this article was written, I have found the following additional 15 cases.

Letulle[6] has written a very beautifully illustrated article describing 11 cases which he personally has seen. Two of these are reported in the above article, namely, those of Jalaguier and Nélaton, while the remaining 9 are not so included. Of these 11 cases, only four cancerous appendices were removed at operation, while seven were discovered at autopsy. It is a remarkable observation that 4 of these latter cases were found in tuberculous patients.[7] Some of these cases illustrate unusual conditions.

Gayet[8] reports a case in which a cancerous appendix was found in a hernial sac, exactly similar to the condition narrated in Patel's case in the above article.

Vassmer[9] relates a case of primary cancer in a gangrenous appendix with peritonitis. The patient died after a secondary enterostomy.

Lubarsch[10] reports the case of a seventeen-year-old boy in the tip of whose appendix, at autopsy, a pea-sized cancer was found.

Weber[11] reports the case of a man, aged forty-three years, who was operated upon for the removal of a ventral hernia, following an operation three years previously for a large appendical abscess. A fist-sized tumor was found in the cecal region which proved to be an adenocancer of the appendix. Recovery.

Lothrop[12] reports operating upon a girl, aged nine years, for an acute gangrenous, perforative appendicitis, with abscess formation. On gross examination, nothing unusual was noticed in the appendix, but later microscopic examination revealed in its centre a primary cancer. The patient recovered. Her youth is noteworthy.

White[13] reports a case of colloid carcinoma of the appendix.

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[6] Revue de gynec. et de chir. abdom., Tome xi, No. 5, Sept.–Oct., 1907.

[7] For a discussion of this association, see Letulle, Bull. Soc. Anat., July, 1903, p. 638.

[8] Revue de gynec. et de chirurgie abdom., 1907, vol. xi, No. 4, p. 687.

[9] Deut. Ztschr. für Chir., 1908, xcl, 446.

[10] Verh. der Deutsch. Path. Gesell., 1907, p. 208.

[11] Petersb. med. Woch., 1906, No. 22, ref. Deut. med. Woch., 1907, p. 1110.

[12] Boston Med. and Surg. Jour., April 2, 1908, p. 450.

[13] Amer. Jour. Med. Sci., 1908, cxxxv, 702.

PRIMARY CARCINOMA AND ENDOTHELIOMA OF THE VERMIFORM APPENDIX.

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In 1900, through the courtesy of Dr. John B. Deaver, surgeon-in-chief to the German Hospital, I was enabled to report 6 cases of tumor of the vermiform appendix—2 cases of fibromyoma, 2 of primary carcinoma, 1 of primary endothelioma, and 1 presumably of secondary carcinoma.[1] At the time of that report I was able to find in the literature the reports of only 18 additional cases of primary carcinoma of the appendix, and some of these were doubtful, that is, doubtful whether the disease was carcinomatous, and whether the newgrowth was primary in the appendix. Since then, however, considerable interest has been manifested in tumors of the appendix, stimulated in part at least by the accidental finding of many of the carcinomas in cases in which their existence was unsuspected until a microscopic examination of the excised organ had been made, and by the comparative youth of many of the subjects.

In 1905 I was able to collect from the literature 25 additional cases, making together a total of less than 40 undoubted cases of primary carcinoma of the appendix.[2] Since then several excellent studies of cases observed personally and collected from the literature have been published, of which it suffices perhaps to mention that by Rolleston and Jones,[3] who collected 42 undoubted cases, and that by McWilliams,[4] who has collected 105 cases.

My first report was based upon a macroscopic and microscopic study of 706 appendices removed at operation by Dr. Deaver during 1897, 1898, and 1899. Subsequently to 1900, although I continued to examine the excised appendices more or less cursorily, that is, with the unaided eye, a microscopic examiniation was made only in those cases in which it was specially requested, or in which the gross appearances suggested lesions of interest. On January 8, 1906 (appendix No. 3097), macroscopic and microscopic examinations of all excised appendices were resumed and have been continued to the present time. During this period 4 additional cases of primary tumor of the appendix have been encountered, which, again through the courtesy of Dr. Deaver, I am enabled to report herewith. The total number of appendices examined up to May 1, 1908, is 4822, of which about 2500[5] have been examined microscopically. A rough estimate of the incidence of tumors in diseased appendices giving rise to symptoms may be based upon the number examined microscopically: including only the 5 cases of primary carcinoma, the incidence is 0.2 per cent.; including also the 2 cases of primary endothelioma, the incidence is 0.28 per cent.

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[1] A Treatise on Appendicitis, by John B. Deaver, second edition (chapter on the Pathology, p. 95), and Univ. Med. Mag., May, 1900.

[2] A Treatise on Appendicitis, by John B. Deaver, third edition (chapter on the Pathology, p. 143).

[3] Primary Malignant Disease of the Vermiform Appendix, AMER. JOUR. MED. SCI., 1906, cxxxi, 951.

[4] Primary Carcinoma of the Vermiform Appendix, ibid., 1908, cxxxv, 822.

An effort has been made to trace the subsequent history of the cases previously reported:[6] Case II, Endothelioma of the Appendix: A woman, aged twenty-four years at the time of operation (March 24, 1898), on February 28, 1908, had had no recurrence, and was perfectly well as far as abdominal conditions were concerned, with the exception of slight constipation. Case III, Carcinoma of the Appendix: A man, aged nineteen years at the time of operation (March 12, 1899), on February 5, 1908, had been in rather poor health since the operation, having sharp pains at times in the right iliac fossa, and the incision being tender at all times; he has had no further operative interference. Cases I and IV could not be traced.

The following is the report of the four additional cases (continuing the orginal numbering):

Case V.—S. B., a married woman, aged twenty-three years, was admitted to the German Hospital January 24, 1906. The family history and the previous medical history are irrelevant aside from the fact that in 1901 the patient had an attack of appendicitis, associated with severe pain in the right side and vomiting, that confined her to bed for three weeks. Four weeks prior to admission to the hospital she was suddenly seized with cramp-like pain in the right iliac fossa, associated with nausea and vomiting. She was confined to bed for one day, but tenderness at McBurney's point persisted for three days. On the day of admission to the hospital there was a recurrence of the pain, but otherwise the patient felt well. Constipation had persisted since the original attack. On admission the patient was found to be poorly nourished. There was tenderness in the region of the appendix. The leukocytes were 10,200 to the cubic millimeter. The temperature ranged from 99.4° to 97.4°, and the pulse from 108 to 72. The urine contained no albumin, no sugar, and no casts.

On January 27 Dr. Deaver removed the appendix, finding it kinked on itself and curled about the cecum. The patient made an uneventful recovery, and was discharged cured on February 7, 1906. On February 11, 1908, information was obtained that the patient was in good health, that she had had no symptoms since the operation, in particular that there had been no intestinal disturbances.

The following are the notes of the examination of the appendix

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[5] This number is approximate only, but it is probably an underestimate.

[6] This was kindly undertaken by Dr. A. D. Whiting, assistant surgeon and registrar to the German Hospital.

(No. 3124): The appendix is curled and twisted upon itself, and makes up a mass of tissue 4.6 x 2.5 cm. On section the organ is seen to be obviously the seat of a newgrowth, grayish white in color and somewhat granular, invading all the coats and causing considerable increase in the thickness of the wall. Longitudinally it extends from the tip almost if not quite to the proximal end. The lumen is quite devious in course and almost completely occluded except toward the proximal end, where there is a small area of dilatation filled with softened necrotic material. The mucosa throughout is roughened, apparently considerably ulcerated and necrotic. Microscopically the appendix exhibits the lesions of chronic interstitial appendicitis, with some acute exacerbation; that is, there is considerable increase in the fibrous tissue in the submucosa and the muscularis, much hyaline metamorphosis, atrophy of the muscularis, and more or less perivascular round-cell infiltration. In addition, the mucosa is wanting throughout, the free internal surface consisting of an exuberant proliferation of epithelial cells arranged in nests of varying size and shape, supported by a well-developed connective-tissue stroma, doubtless the remains of the submucosa. For the most part these epithelial cells are the seat of mucoid degeneration; many of them have completely lost their individual identity and appear as more or less necrotic debris. There is a varying degree of epithelial infiltration of the muscularis, extending in some places almost if not quite to the serous coat, in which regions the identity of the individual epithelial cells is much more apparent than in the submucosa.

Diagnosis. Mucoid (colloid) carcinoma of the appendix; chronic interstitial appendicitis with acute exacerbation.

CASE VI.—F. L. B., a single girl, aged seventeen years, was admitted to the German Hospital February 27, 1906. One brother died of carcinoma of the stomach; otherwise the family history and the previous medical history are irrelevant. Eight hours prior to admission to the hospital the patient was seized with acute abdominal pain, at first general in distribution, but gradually becoming localized to the right iliac fossa. On admission she was a well-developed, well-nourished girl. The abdomen was markedly rigid on the right side and very tender over McBurney's point. No mass was palpable. The urine contained no albumin, no sugar, and no casts. The temperature was 99.6°, and the pulse 100.

On February 27 Dr. Deaver removed the appendix, which was found non-adherent; there was no free fluid in the peritoneal cavity. The patient made an uneventful recovery, and was discharged cured on March 12, 1906.

The following are the notes of the examination of the appendix (No. 3181): The specimen consists of an appendix 9.5 cm. long, and from 0.9 to 1.2 cm. in thickness, the distal 6 cm. being the more distended. The serosa is covered with a fibrinoplastic exudate and reveals marked injection of the vessels. On section the distal dilated portion is found to be separated from the proximal portion by a well-marked constriction, and to be filled with sanguinopurulent material; the wall is very thin, the mucosa much ulcerated and reveals many small submucous hemorrhages. (A newgrowth was not observed until the microscopic examination was undertaken, when it was seen macroscopically as a small infiltration of the submucosa, 2 to 3 mm. in diameter, opposite the attachment of the mesentery, and extending 1.5 cm. from the constriction near the middle of the appendix toward the proximal end.) Microscopically there were the lesions of acute appendicitis of moderate grade: vascular dilatation, œdema, round-cell infiltration, and foci of hemorrhage in the mucosa and submucosa, and loss of considerable of the epithelial covering of the mucosa. The newgrowth consists of narrow columns of cells, usually not more than two cells in width, but ten or more cells in length, infiltrating the spaces of the connective tissue of the submucosa. The collections of cells often taper to a point at their extremities, although in some regions they are ovoid or rounded, and have apparently quite an intimate relationship with the surrounding connective tissue; in some regions a plexiform arrangement, or anastomosing network, of the columns of cells may be made out; in other regions the origin of the cells from the endothelial lining of the lymph channels is obvious in their lining such spaces, which here and there are somewhat dilated, and in their gradual increase in size and thickness. The individual cells vary somewhat in shape, but, as a rule, they are ovoid or elongated, corresponding with the shape and direction of the lymph spaces that they line; toward the extremities of many of the spaces the cells are quite flattened. The nuclei for the most part are ovoid or elongated, stain well, and are rich in chromatin. The supporting connective tissue contains relatively few cells; it is largely homogeneous and evidently the seat of hyaline degeneration.

Diagnosis. Endothelioma of the appendix; acute appendicitis.

Case VII.—L. B., a single woman, aged twenty-seven years, was admitted to the German Hospital December 30, 1907. The family history and the previous medical history are irrelevant aside from the fact that the patient had typhoid fever at the age of nine years. Two years prior to admission to the hospital she had a severe attack of pain in the right upper abdominal quadrant, with radiation to the right shoulder, a chill, but no vomiting. Subsequently she was jaundiced for two months. The pain has been almost continuous since, and there have been several acute exacerbations. The patient has been markedly constipated, but there have been no other digestive disturbances; nor have there been continued chills, fever, or sweating. On admission the patient was well developed and well nourished. There was some tenderness along the right costal margin and slight rigidity of the upper part of the right rectus muscle. The temperature was 99°, the pulse 52 to 92. The urine contained no albumin, no sugar, and no casts. The hemoglobin was 78 per cent., the leukocytes 6500, and the coagulation time ten minutes. Examination of the stools revealed no parasites and no eggs; the occult blood test was faintly positive.

On January 4, 1908, Dr. Deaver operated, making an incision through the upper part of the right rectus muscle. The gall-bladder was found normal and to contain a small amount of bile, which was readily discharged through the biliary ducts. The surrounding organs also appeared to be normal. The wound was closed, and a second incision was made over the region of the appendix and the appendix was removed. The patient made an uneventful recovery, and was discharged cured January 18, 1908.

Th following are the notes of the examination of the appendix (No. 4594): The appendix is 8 cm. long, and 0.3 cm. thick, except at its distal extremity, where there is a bulbous enlargement 1.3 cm. in thickness and 3 cm. in the length of the organ. The vessels of the serosa are somewhat injected. The lumen is almost completely occluded by swelling of the mucosa, except in the region of the bulbous enlargement, where, although there is increase in thickness of the mucosa and the submucosa, there is also an obvious lumen containing a small amount of turbid fluid. (A newgrowth was not observed on macroscopic examination, but was subsequently found to comprise a small nodule, about 3 mm. in diameter, opposite the attachment of the mesentery, and extending 2 cm. from the tip of the organ.) Microscopically the lesions of chronic interstitial appendicitis with acute exacerbation are apparent; that is, there is considerable connective-tissue hyperplasia with hyaline metamorphosis, vascular dilatation, œdema, round-cell infiltration, foci of hemorrhage, and shedding of the epithelial covering. The newgrowth in the distal end consists of nests of cells of varying size and conformation, supported by a well-developed connective-tissue stroma; the submucosa especially is the seat of the epithelial infiltration, but there is also a moderate infiltration of the muscularis, even to the subserosa, where the nests of cells are usually large. The individual cells are epithelial in type, of moderate size, polyhedral in shape, and have clear vesicular nuclei that stain well.

Diagnosis. Carcinoma of the appendix; chronic interstitial appendicitis with acute exacerbation.

Case VIII.—M. K., a single woman, aged twenty-eight years, was admitted to the German Hospital January, 1908. The family history and the previous medical history are irrelevant. The present illness began three days before admission to the hospital with severe cramp-like pain in the abdomen, that soon became localized in the right iliac fossa, nausea and vomiting, but no chill. On admission the patient was well developed and well nourished. There was marked tenderness and rigidity on the right side rather high up (about the level of the umbilicus), and a mass was palpable. The hemoglobin was 88 per cent., and the leukocytes 25,800. The temperature varied up to 103°, and the pulse up to 132. The urine has a specific gravity of 1015 to 1031, revealed a faint trace of albumin, but no sugar and no casts.

On January 11 Dr. Deaver operated. On opening the peritoneum considerable pus was evacuated. The appendix was found acutely inflamed, perforated, and adherent to the colon; it was removed. The patient made an uneventful recovery, and was discharged on the thirtieth day after operation with a granulating wound.

The following are the notes of the examination of the appendix (No. 4609): The appendix is 6 cm. long and from 0.6 to 1.5 cm. in thickness. There is marked injection of the vessels of the serosa. The tip is much dilated—the lumen to 0.8 mm. in diameter, and contains a hard calculus; here the wall is reduced to 3 to 4 mm., the mucosa is rough, ulcerated, and reveals small foci of hemorrhage. Elsewhere the lumen is variously dilated and constricted, the mucosa roughened, and shows foci of hemorrhage. (The newgrowth was not detected macroscopically, and even after it had been found microscopically there was nothing to suggest its presence to the unaided eye.) Microscopically the appendix reveals slightly increased fibrosis of the submucosa and muscularis, and the ordinary phenomena of acute inflammation: vascular dilatation, œdema, cellular infiltration, foci of hemorrhage, shedding of the epithelium, etc. The newgrowth is limited to the dilated peripheral extremity of the organ, and is almost if not quite annular. It consists of nests of cells supported by a well-developed connective-tissue stroma, obviously, in part, at least, remains of the submucosa; the mucosa is almost if not quite missing. There is a moderate infiltration also of the muscularis, especially near the subserosa. As a rule, the nests of cells are very large. The individual cells are epithelial in type, of moderate size, polyhedral in shape, and have clear vesicular nuclei that stain well.

Diagnosis. Carcinoma of the appendix; acute ulcerative appendicitis with perforation.

THE SURGICAL ASPECTS OF DUPUYTREN'S CONTRACTION.

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With the expansion and better grouping of surgical knowledge, there is a strong tendency to do away with the names of those surgeons who have first described conditions or who have been indubitably associated with them. However wise such a procedure may be from the scientific standpoint, one who is interested in the history of surgery cannot but regret the change. But there are some conditions to which the names of their investigators are tightly forged, and I have no doubt that in the years to come the name of the great French surgeon, whose strong convictions and firm insistence first compelled a hearing, will be associated with contraction of the palmar fascia. Basing his beliefs on the dissection of a case, he proclaimed his findings in 1831,[1] and with that self reliance and personal assurance which was so characteristic of him, showed the falsity of the then current opinion that the deformity was due to the contraction of the tendons. In his "Leçons Orales," in 1832, and his lectures, delivered in 1833, he reiterated time after time his beliefs, winning acceptance by the force of his persuasion. Henry Cline, in his lectures of 1808, and Sir Astley Cooper, a little later, allude to the true character of the deformity, but their opinions were not backed by pathological observations.

An extensive literature has grown up around Dupuytren's first dissection, which has served to confirm and expand his principles. Although the contraction is fairly common, the subject is treated so briefly, and many times incorrectly, in our surgical treatises, that I have thought it advisable to review the main facts in the anatomy, pathology, and etiology of the disease before proceeding to discuss its radical treatment.

The onset of Dupuytren's contraction is most interesting. A middle-aged or elderly man will notice that his ring- or little finger is somewhat stiff, and will often assign the cause to rheumatism, with which he may have been previously afflicted. Local pain may be slight or entirely wanting, but he finds that extension of the affected part is in some way impeded. As the months pass and the condition does not improve he may notice that there is a slight puckering of the skin over the metacarpophalangeal joint, as if a subcuticular suture had been gradually tightened. Later, small and hard nodules appear, and the hills and valleys, which have been noticeable in the palm, become more marked. The disease proceeds insidiously; the joints gradually increase their flexion, and there are seen in the palm, along the lines of the flexor tendons to the affected fingers, hard, unyielding bands, to which the skin seems to be most intimately attached. A long period of time has elapsed since the first symptoms, and the trouble may now be spreading to adjacent fingers, which, in turn, begin to contract; the palmar bands become more noticeable, and the furrows between them deepen. Flexion may be so pronounced that the finger-nails press into the flesh of the palm, and the patient's condition is pitiable. Forcible extension is impossible, and the contracted, deformed hand is of little or no service.

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[1] Journal universal et hebdomadaire de médecine et de chirurgie pratiques, Paris, 1831.

To Adams,[2] who first brought the pathology and surgical treatment into general notice in England, and to Keen,[3] who performed a similar service in this country, we owe much. From the statistics of Keen (23 personal cases and 95 cases from the literature), Noble Smith[4] (70 cases), and Nichols[5] (50 cases), we may deduce the following facts: The disease occurs in men of all classes and generally after the fortieth year. It is met with but seldom in women, and Adams states that he considers it about ten times as common among men. The two hands are attacked in nearly equal proportion, the disease showing a decided preference for the ulnar side, originating in the ring or little finger or in both. Its hereditary character is worthy of mention. Adams has noted it in several cases, and Keen found it in nearly one-third of the records. Adams has stated that the disease is largely due to gout, and Keen has emphasized the fact that it is found connected with a gouty or rheumatic history. Smith states that his inquiries were against these conditions being the cause, while Nichols fails to find that the disease is a manifestation of, or results from, rheumatism. In many cases the hands are affected symmetrically. Of its frequency we have various testimony, but the largest statistics have been compiled by William Anderson.[6] He states that of 2600 adults of the poorer classes in English infirmaries, about five-sixths of whom were over middle age, 33 (1.27 per cent.) were affected.

If we make a careful dissection of the fingers and palm, we find that directly under the skin and above the fascia proper is a dense layer of fibro-areolar tissue, the superficial palmar fascia, perhaps more marked on the ulnar side of the palm than elsewhere, and extending well up on the fingers. The fibers are thin, but very strong, and they form a sort of web, which is everywhere filled by fatty tissue. Traversing this layer are a very great number of strong fibers which closely bind the skin to the fascia below, and are best appreciated by the dissector by the gritty feel which they impart to the scalpel. These are particularly noticeable upon the ulnar side. This cross fibrous layer is not emphasized in our anatomies, but its bearing on Dupuytren's contraction is most important. It will be remembered that the contraction first involves the ulnar surface of the hand.

Below this there is the deep palmar fascia, satisfactory descriptions of which are given in our anatomical text-books. Arising above from the annular ligament and the palmaris longus muscle, it spreads fanlike over the palm, its firm, fibrous bundles being inserted into the lateral margins of the anterior ligaments of the metacarpophalangeal joints of the four fingers. Some fibers, however, go to the bases of the first phalanges, while others go to their sides and reach down even to the second and third phalanges. Besides these, there are median fibers extending down each finger to the base of the second phalanx.

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[2] Observations on Contractions of the Fingers, London, 1892. Remarks on the Contraction of the Fingers, Proc. Med. Soc. London, 1879–81, v, p. 132. Dupuytren's Contraction of the Fingers in Women, Brit. Med. Jour., 1882, i, 84.

[3] Etiology and Pathology of Dupuytren's Contraction of Palmar Fascia, Proc. Phila. Co. Med. Soc., 1881–82, iv, 108; also Phila. Med. Times, 1881–82, xii, 370.

[4] Brit. Med. Jour., March 29, 1884, p. 603.

[5] A Clinical Study of Dupuytren's Contraction of the Palmar and Digital Fascia, Amer. Jour. Med. Sci., 1899, cxvii, 285. Histology of Dupuytren's Contraction of Palmar Fascia, Med. News, 1889, lxxv, 491.

[6] Deformities of the Fingers and Toes, London, 1897.

To the surgeon who performs an open operation for the relief of this contracture, certain of these bands lying in the axes of the fingers appear as large, firm, and very resistant cords stretched tightly across the palm, as is stretched the string to a bow. Above these fibers the subcuticular tissue is very thin or entirely lacking, and so thick are these cords at times that they often have been mistaken for the flexor tendons. This is an error which the best of surgeons have made, and is commented upon by all those who have written extensively of the operative interference. There is no doubt that, in some operations, after the skin has been carefully dissected away from the bands and the fingers fairly well freed, by incisions along their surfaces, the large bands of the offending fascia have been left in situ. If the operator will but go a little deeper, he will find the flexor tendons lying in their sheaths. Again, the fibrous bands will at once be recognized from the fact that they are inserted on the base and sides of the first phalanx. This is not the case with the tendon; it does not divide here, neither does it have an attachment to the first phalanx. Again, the finger tips may be inserted beneath the bands, whereupon the movements of the flexor tendons are readily appreciated.

Microscopic examinations have been made by a number of observers, notably Richer,[7] Chevrot,[8] Langhans,[9] Anderson,[10] and Nichols,[11] and the following facts observed: The stratum corneum has been found by some to be thickened, while others have denied skin changes. It is probable that they do not take place, if at all, until late in the disease. The contracted bands are found to consist of very dense and firm fasciculi longitudinally arranged. They are, in general, similar to the normal fascia, which may lie adjacent to them, the bands being but a hypertrophy of a circumscribed tract. In cases in which the contraction is fairly recent, these fasciculi are well mixed with connective tissue elements and bloodvessels, but in cases in which the contraction has extended over a period of years these fasciculi are fused into a homogeneous mass and the cellular and vascular elements, which were earlier present, have entirely disappeared.

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[7] Progress médicale, Paris, 1877, v, 369.

[8] Recherches sur la rétraction à l'aponeurose palmaire, Paris, 1882, p. 21.

[9] Quoted in Brit. Med. Jour., January 10, 1891, p. 62.

[10] Loc. cit.

[11] Loc. cit.

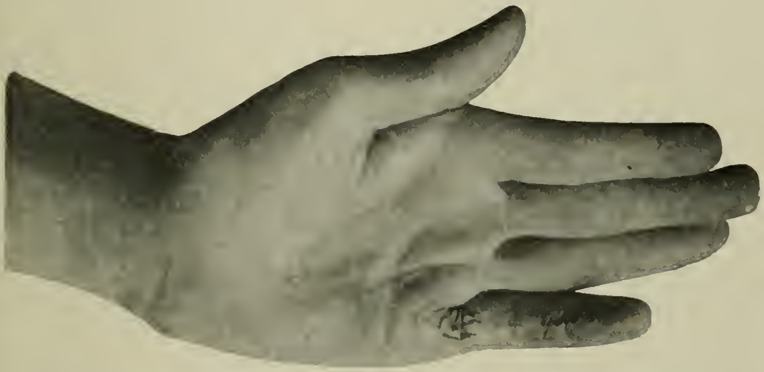
While this picture points to a definite hypertrophy, its causation is obscure and has led to much speculation. Dupuytren held the opinion that the disease resulted from slight local traumas, and there are certain facts to be mentioned in favor of this view, and others against it. Adams and Keen gave gout a prominent place in the etiology, while many have thought that rheumatism lay at the bottom of the trouble. Still others have placed the disease among the nervous disorders, and their claims will be set forth later.

In the instances of the contraction which have come under my notice I have seldom failed to elicit some history of trauma. In some cases the trauma has been severe; in others, but slight. Habitual contracture, as in handling a shovel or driving a team, has been now and then complained of. The traumas were of the most varied kinds, and, feeling that there is a strong tendency on the part of patients to find an outward and material cause to account for such deformities, I have not laid much stress on these portions of their histories.

Recently, however, I have operated on a case of contracted fascia in which the history of trauma was most perfect and in which the evidences of trauma are still present. The patient, an intelligent man of forty-two, is firmly convinced as to the origin of his trouble. He has worried much over it, and has carefully watched the progress of the disease. The account which he gives of its onset and its gradual development is most complete. He states that it dates from four years ago, when he received an abrasion over the metacarpophalangeal joint of the little finger, left hand, while lifting some heavy timber in a mine, work to which he was unaccustomed. A calloused surface formed, which soon peeled off; the part has never healed properly, and has since remained a constant source of irritation. About two months after the beginning of his trouble he noticed that he could not fully extend his finger, and that there were a few hard nodes contiguous to the abrasion, lying in the palm in the axis of the little finger. These coalesced into a cord, and at the time of operation this fibrous band was sharply marked upon the surface, the skin over it being elevated and firmly adherent to it. The finger was contracted almost to a right angle, and the last phalanx was flexed to its full extent, resting closely upon the second. The patient was of the opinion that some grit or fine gravel had been ground into the hand, and cautioned me carefully at the time of operation to look for such foreign material at the site of the abrasion. He bears no evidence of the existence of the disease in the other hand. His general health is very good, and he has never suffered from gout or rheumatism. The accompanying photograph was taken three weeks after operation. The scar in the palm is hardly noticeable, but the abrasion remains the same as before.

Another patient, on whom I operated some two years ago, was a dishwasher by occupation, and he came to me for amputation of his ring finger, it being tightly flexed in the palm of his hand, due to contraction of the palmar fascia. The disease was of some four years' standing. Paronychia and excoriations and abrasions on the palms and fingers are common in this class of subjects, and the patient bore the marks of his occupation. He stated that his hands were habitually sore and tender.

Such a history as this is suggestive, but does not make an impression like the first case. Out of 50 cases examined, Nichols[12] found 15 which could be associated with more or less recent irritation or trauma. It is generally held by the older writers on the subject that gout and rheumatism are important factors in the etiology. Subsequent investigations have failed to verify this opinion, and personally I have not been able to trace any of my cases to such a causation.



Dupuytren's contracture apparently of traumatic origin. Photograph taken three weeks after the operation. Note the calloused surface at the metacarpophalangeal joint.

Of the nervous origin of Dupuytren's contraction much can be said, and it is at present the popular theory. Certainly the tingling and prickling sensations which are sometimes present in beginning cases are suggestive of the paresthesias of nerve lesions. Again, the fact that undoubted cases of heredity have existed is a difficult one to combat from the standpoint of simple trauma. We have no explanation to offer of the truth that it occurs on the ulnar side of the hand unless, as has been claimed, it arises from the fact that the skin is not as thick here, thus exposing the fascia to insult. Such an explanation seems hardly warranted. The condition of the fascia on this side has been commented on in considering the anatomy, but while it has a most important bearing on the clinical picture, we are not justified in going so far as to connect it with the etiology. That the disease is so often bilateral is certainly a strong point in favor of its nervous origin. Recently there has been a reaction against the nervous theory, and Ledderhose[13] believes that the beginning of the disease is an inflammatory proliferative process in the aponeurosis, and that subsequent trauma leads to the formation of nodules and finally to retraction.

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[12] Loc. cit.

The age of onset, which is generally past middle life, has been given as an argument for the nervous origin of the disease, and those who believe in a traumatic origin can only cite in rebuttal the disappearance of subcuticular fat with advancing years. If we grant that the condition is due to trauma alone we shall be obliged to admit that it should be met with much more frequently. As in other conditions, we cannot overlook an hereditary tendency or a predisposition on the part of the tissues. Taking this into account, Myrtle[14] has argued that, as in manual labor the skin becomes much thickened, this cause, an irritative hyperplasia, is competent to affect the underlying fascia.

It is probable that no single factor can satisfactorily cover the etiology, and it is interesting here to note Abbé's[15] theory of the origin of the disease: a slight traumatism, then a spinal impression produced by this peripheral irritation, following which comes a reflex disturbance at the seat of trauma, an insensible hyperemia, and pathological changes in the fascia.

From the consideration of the various degrees of the contraction, it is at once evident that no one method of operative interference will apply to all cases, and that the surgeon must adapt his procedure to the particular problem which confronts him. As one looks over the literature, he is struck by the excellent results and the wide range of application of the method of subcutaneous incision. This procedure, which was introduced in England by Adams and popularized in this country by Keen and Abbé, consists in dividing the contracting bands by many subcutaneous sections, a knife with a very narrow blade (Mr. Adams employing a blade of $\frac{1}{16}$ inch width) being used. It was necessary in severe cases to make many such incisions, Adams in one instance having used eighteen, and Abbé twenty-five. Such a method is difficult; it requires an accurate knowledge of the pathology of the disease and the anatomical topography, and, moreover, it does not appeal to our present ideas of surgical thoroughness. Yet the excellent results reported by the method in the hands of a number of observers, many of the cases having been followed over a period of years, show the curative value of operation and what great success may follow an incomplete procedure.

The operations which have been performed by those who have favored the open method have been characterized by long incisions or the making of extensive flaps in order to facilitate the complete removal of the offending fascia. Some have advocated the total excision of the skin of the palm, allowing the wound to granulate, or have sought to fill this extensive denudation by skin grafts or by a large flap taken from the back of the hand. Others have adopted a V-shaped incision, the angle of the V pointing toward the forearm, and, as such a flap is almost certain to slough, it has generally been excised at the time of operation. Parallel incisions have also been made, one on each side of the offending band, and the fibrous structure and the skin overlying it excised. Reviewing these radical operations, it is evident that here, as in so many other instances, the surgical pendulum has swung to its extreme in the opposite direction. We should not forget the good results reported by many observers with the subcutaneous operation and the fact that Adams, who probably had the largest experience in this field, has made the statement that the method is applicable in the severest cases. In extreme conditions a sacrifice of skin may become necessary, but such cases are not frequent. When the cords are very pronounced it will be found that the subcuticular fat has entirely disappeared, and the fibrous fascia is strongly adherent to the skin. Yet the skin can be saved by careful dissection.

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[13] Quoted in von Bergmann's Surgery.

[14] Dupuytren's Contraction of the Fingers, Brit. Med. Jour., 1881, ii, 894.

[15] On Dupuytren's Finger Contraction, its Nervous Origin, N. Y. Med. Jour., 1884, xxxix, 436; Further Remarks on Theory of its Nervous Origin, Med. Rec., 1888, xxxiii, 236.

I have begun my operation upon the contracted fingers instead of the palm. The parts being thoroughly cleansed, small incisions, running in the axes of the fingers, are made with a straight, sharp-pointed bistoury on the palmar surface and directly over the affected joints. An incision of 1 cm. or less is all that is necessary, except in very severe contractions. The skin and what subcuticular fat is present is then carefully dissected back on both sides, when the long fibrous bands will be seen. These are excised, and an endeavor then made to straighten the affected finger. This will usually not be possible, and it will be found necessary to pass the knife down deeply around the joint, the other hand serving as a guide outside, so as not to buttonhole the skin. A gritty feel warns the operator when he has arrived at the lateral fibers, which sometimes run nearly as far back as the extensor tendons. These are in turn divided. If the joint be a terminal one, and the bone has not become hypertrophied, it can now be brought to full extension. The same statement generally applies to the first phalangeal joint, but at the metacarpophalangeal articulation it will be necessary to cut the lateral insertions of the deep palmar fascia. These lateral insertions will have become changed into heavy cords, which are strongly adherent about the joint, while other thick fibers run to the sides of the phalanx. Besides these structures there will generally be a median cord, which must be excised. This, if present, will be firmly adherent to the skin over the joint and the shaft of the phalanx.

The fingers are now quite free, and it remains for the operator to remove the heavy fibrous bands which run in their respective axes. This can be accomplished through comparatively short incisions, which I prefer to make slightly to the side of the summit of each band. The skin is then undermined on all sides, and it is surprising how much can be done through a small opening if the surgeon be possessed with the necessary patience and if he exert a proper amount of care. The band being freed, it is excised. In beginning cases portions of glistening palmar fascia, macroscopically as yet unchanged, are seen in the vicinity of the bands; these should be removed as thoroughly as possible. The palm should now be placed upon the stretch and carefully examined for other points of contraction. Bleeding is generally considerable; I prefer to control it, with this method of small incisions, by an Esmarch bandage about the wrist, being careful that hemorrhage has absolutely ceased before suturing. The edges of the wound are coapted by a through-and-through continuous suture of fine silk.

The fingers are placed in extension upon a dorsal wooden splint. Passive movements should be begun as early as possible; I have removed the splint and made these movements as early as the sixth day. The splint is omitted after the tenth day. The endeavor should be to perform the work thoroughly through a small incision, for operative wounds of the hands often do not heal kindly, and a large resulting cicatrix will not only be unsightly but may limit motion. I have done the operation under local cocaine anesthesia, but with the above technique I prefer a general anesthetic. Anesthesia for a period of a half-hour may be obtained by infiltrating the median and ulnar nerves with a 2 per cent. cocaine solution.

The method which I have here described is, in general, one which has often been employed, but I have outlined it in order to emphasize the fact that it is possible to perform the operation through smaller incisions than have heretofore generally been used.

TORSION OF APPENDICES EPIPLOICÆ AND ITS CONSEQUENCES.

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Although the anatomical nature of appendices epiploicæ has been thoroughly discussed, and loose bodies, or corpora aliena, in the abdominal cavity or in hernial sacs, resulting from torsion of their pedicles, have been reported at autopsy in quite a number of instances, until quite recently very little was known of their pathology. One of the earliest references to the pathological importance of appendices epiploicæ and their corpora aliena is contained in the lectures on pathological anatomy by Wilks and Moxon[1] (1889), in which it is stated that "a surgeon found such a body in a hernial sac, and an altered appendix, still attached, was found to have caused the strangulation that made operation necessary." In 1894 Riedel,[2] of Jena, reported the removal of two corpora aliena which had given rise to symptoms of gallstone colic. No further communications appeared, however, until November 28, 1905, when Riedel[3] contributed a paper on "Torsion of Appendices Epiploicæ and Its Consequences," with a report of 8 cases, of which the following is a *resume:*

CASE I.—Attacks of pain simulating gallstone colic; no tumor. Diagnosis of adhesion of gall-bladder. Two corpora aliena, almost as large as a cherry, were removed at the operation. Three years later the attacks recurred, and the patient committed suicide. At autopsy two more foreign bodies were found.

CASE II.—Student, aged twenty-five years. Four years ago an appendical abscess was opened, the distal end of the appendix coming away. Three indefinite attacks recently, apparently of appendicitis. At operation a yellow roundish foreign body 1.5 cm. long and 0.75 cm. thick slipped out of the peritoneal incision. The appendix, well closed distally, and apparently not inflamed, was lightly adherent to the cecum. Recovery.

CASE III.—Max B., aged thirty-two years; apparently typical attacks of gallstone colic, with jaundice. No tumor; vague tenderness in the region of the gall-bladder. At operation the liver showed numerous yellow plaques. The gall-bladder contained no stones; the bile duct was not distended. The omentum was adherent to the liver and the transverse colon, and two corpora aliena adiposa were lightly adherent to it. They were flat, roundish, calcareous bodies, one 0.75, the other 1.25 cm. long. A third body, still smaller, was lying free in the mesocolon. A number of appendices epiploicæ were hanging by a mere thread from the transverse colon, their distal ends not more than 2 or 3 cm. thick; none was twisted. Recovery.

CASE IV.—Mrs. W., aged forty-one years, symptoms of peritonitis, including fecal vomiting. Operation: Cloudy serum and shreds of fibrin in the peritoneal cavity. Jejunum and large intestine much distended; ileum less so. No appendicitis or cholecystitis. A crescentiform appendix epiploica, attached to the descending colon, with a flat, gray, foreign body about 1.5 cm. long and 1 cm. wide, lying free between it and the abdominal wall, was seemingly the sole cause of the peritonitis. The appendix epiploica was not twisted. Apparently it had straightened out after separation of the distal end. The peritoneal cavity was flushed out and the wound closed. Patient died on the third day. At autopsy no further cause of peritonitis was discovered. A luxuriantly growing bacillus, apparently Bacillus coli communis, was cultivated from the central part of the corpus alienum.

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[1] Lectures on Pathological Anatomy, 1889.

[2] Ueber Adasiv-Entzundungen in der Bauchohle, Arch. f. klin. Chir., Berl., 1894, xlvii, 153–215.

[3] Münch. med. Woch., November 28, 1905.

Case V.—Vomiting for fourteen days, finally fecal; general condition good. Operation: An oblong corpus alienum, somewhat constricted in the middle, and about as large as a bean, lay free in the peritoneal cavity. The parent appendix epiploica seemed to spring from the cecum, and was adherent to a coil of small intestine in such a way as to act as a constricting band. The small intestine was greatly distended. The appendix epiploica was easily removed. Recovery good.

Case VI.—Gustav Gerhard, aged forty years; obstruction of the bowels. Operation: Fluid in the peritoneal cavity; jejunum greatly distended; ileum less so. In the right iliac fossa, arising from the left wall of the cecum, an appendix epiploica stretched across the ileum and was adherent by its twisted middle portion to the mesentery of a coil of small intestine, and compressed the ileum firmly against the posterior abdominal wall; the distal end, about the size of a bean, and still attached to the twisted part, was gangrenous. The ileum was greatly contracted at the point of crossing. The appendix epiploica was quickly removed; the ileum was opened about 20 cm. above the obstruction and the entire small intestine, which was very much inflamed, was emptied of its contents. The patient died on the following day. Autopsy showed peritonitis of a mild grade, as had been demonstrated at the operation.

Case VII.—Hulda G., aged fifty-six years; admitted April 27, 1904. Eight days previously patient had complained of pain in left abdomen, and consulted a physician. In the right inguinal canal was a reducible hernia as large as a small apple, and on the left side, below Poupart's ligament, was a hard, insensitive, irreducible tumor of the size of a walnut, which, on operation, proved to be a femoral hernia. A necrobiotic appendix epiploica twisted once on its axis and adherent at the distal end was found in this hernial sac. Removal. Recovery.

Case VIII.—Anna B., aged twenty years; admitted August 14, 1905. Has had reducible femoral hernia on left side for two years and an irreducible femoral hernia on the right side for fifteen months. Was taken with abdominal pain on the afternoon of August 13; left hernia sensitive and irreducible, but was reduced spontaneously during the following night, after a hypodermic injection of morphine. At 2 P.M. of the next day a corpus alienum 1 cm. by 0.5 cm., hanging by a fresh and still bloody thread of fibrin, was found in the left hernial sac.

Virchow, who, as quoted by Riedel, has given us a careful description of corpora aliena in all their phases, mentioned a case in which the patient died with symptoms of peritonitis, and at autopsy a hard body, larger than a cherry, was found free in the peritoneal cavity; the vermiform appendix was normal.

The fact that changes in the fatty appendices of the colon may give rise to pathological complications of such magnitude as those described by Riedel excited considerable interest among other observers. Six further cases have been reported during the brief space of time which has elapsed since the publication of Riedel's paper, and the literature now contains detailed accounts of 14 cases in which appendices epiploicæ, or resulting corpora aliena, necessitated surgical intervention. In 8 of these cases the appendices were situated in the hernial sac, intra-abdominally in the other 6.

Lorenz[4] reports a case of irreducible right labial hernia in a woman, aged thirty-three years, in which operation revealed a narrow, tense pseudoligament about 6 cm. long, among loops of intestine, inserted mesially to the neck of the hernial sac, and around which an appendix epiploica, arising from the colon, had become twisted and strangulated. The immediate parietal and visceral peritoneum was covered with fresh deposits of fibrin, and the twisted appendix showed several slight subserous hemorrhages and necrosis of the pedicle at the point of strangulation. The band and strangulated appendix epiploica were removed, the intestines returned to the abdomen, and the patient made an uneventful recovery.

Shortly after the appearance of Lorenz's article, v. Bruns[5] reported a case of irreducible left inguinal hernia in a woman, aged fifty-five years, who was suddenly taken with pain about eight days prior to operation. The skin over the hernial area was red and œdematous. Incision allowed a small quantity of fluid to escape, and revealed a gangrenous strangulated appendix epiploica, which was removed. The patient made a good recovery.

Muscatello[6] reports 2 cases of hernial incarceration of appendices epiploicæ. One occurred in a woman, aged fifty-six years, who was suddenly attacked by violent femoro-inguinal pain, radiating all over the abdomen, and in which the diagnosis of strangulated crural hernia of the omentum was made. Operation under cocaine-adrenalin anesthesia allowed the escape of a clear yellow fluid, and the exposure of two appendices epiploicæ, measuring 2 cm. and 1.5 cm., respectively, attached by narrow pedicles to the sigmoid colon. One of these bodies was of a dark brown color; both were removed, and the patient recovered.

The other case appeared in a peasant, aged thirty-two years, who experienced a sudden attack of pain in the left inguinal region six months before observation. A month later the pain had entirely disappeared; a small tumor was observed and continued to enlarge. A diagnosis of oblique external entero-epiploic inguinoscrotal hernia led to operation December 9, 1905. Incision of hernial sac and removal of omental flap; an appendix epiploica was adherent to the posterior border of neck of hernial sac and twisted about 0.5 cm. from its colonic origin. A free appendix epiploica was attached about 0.5 cm. below neck of hernial sac. The sigmoid colon was adherent to the neck of the hernial sac for about 3 cm. Removal of appendices. Recovery. The latter case proves that hernial incarceration of appendices epiploicæ may occur and disappear spontaneously, but may later result in secondary changes, such as intestinal adhesions to the neck of the sac, the formation of external hernia, or may cause rapid enlargement of an existing hernia.

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[4] Wien. klin. Woch., vol. xviii, pp. 1367, 1368.

[5] Brucheinklemmung einer Appendix epiploica, Münch. med. Woch., 1906, liii, 16.

[6] Brucheinklemmung der appendices epiploicæ und ihre Folgen, Münch. med. Woch., 1906, ii, 1868.

To the 2 cases of hernial strangulation of appendices epiploicæ without torsion, reported by Muscatello, and a third, reported by v. Bruns, Mohr[7] contributes a fourth, which occurred in a rather fat male, aged sixty-two years, who first noticed a small, painless tumor in the region of left inguinal ring, three or four years before observation. It protruded frequently, but was always readily reduced. Recurred ten days ago; irreducible. Diagnosis of probable incarcerated omental hernia. Operation: Exposure of long delicate vermiform, free, fatty tumor, whose distal end was hypertrophied, presented hemorrhagic infiltration and was attached to posterior wall of hernial sac. The tips of two other appendices epiploicæ arising from the sigmoid colon had become strangulated at the neck of the sac and were about to undergo gangrene. They were removed. Recovery complete.

Kruger[8] reports a case in which torsion of the appendix epiploica occurred within the hernial sac. A revenue officer, somewhat stout, aged fifty-six years, gave history of pain in right groin twenty years ago, which disappeared entirely after a few weeks; recurrence two years ago. Four days before admission to hospital he had another attack, with pain radiating from urethra to umbilicus; firm tumor in inguinal region. Diagnosis: Strangulated epiplocele. Operation, May 17, 1907, revealed an appendix epiploica, 4 cm. long and 1.5 cm. wide, springing from the cecum by a short pedicle, which had passed through the inguinal canal and had become twisted in the hernial sac, giving rise to inflammatory symptoms. The pedicle was ligated about 3 cm. above the inner inguinal ring and divided; removal of appendix epiploica, hernial sac, and neck. Recovery uneventful. Krueger states that it is possible that the inflammation might have disappeared spontaneously, as it did twenty and two years previously, respectively, but the likelihood of recurrence of torsion and gangrene, followed by peritonitis, justified the radical operation.

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[7] Brucheinklemmung von Appendices epiploicæ, Münch. med. Woch., 1907, liv, 170.

[8] Zur Torsion der Appendices epiploicæ, Münch. med Woch., 1907, liv, 1813.

Having briefly presented a synopsis of the cases reported in the literature, I now wish to report a case which came under my own observation, making the fifteenth case in which operation was necessary.

S., aged thirty-five years, with no history of previous abdominal trouble, was taken, at 4 A.M., September 26, 1905, with severe pain in the right iliac region. This gradually subsided, and he took the seven o'clock train for Davis, and from there drove several miles into the country. The pain increased so that he was compelled to return to Davis, where he saw Dr. Bates and received a hypodermic injection of morphine. He then took the train for Sacramento, where I saw him at 10 P.M. of the same day. The region of the appendix was painful and sensitive, and a tumor an inch and a half in diameter was distinctly palpable at the usual site of the appendix. The pulse was 80, the temperature normal. These findings remained practically unchanged until October 1, when the temperature rose to 100° F., and the operation was done. Presenting in the incision was a dense tumor about an inch and a half in length and one inch in width, having the appearance of a hematoma with a peritoneal envelop. It was universally adherent and was attached to the cecum by a narrow, rugous, and twisted pedicle. The neighboring glands were enlarged. The appendix, though seemingly normal, was removed. Recovery was uninterrupted. Macroscopic examination, combined with microscopic findings, showed the tumor to be an appendix epiploica, and the vermiform appendix to be normal.

In a study of the cases of torsion of appendices epiploicæ we find that they may be divided into two classes, intra-abdominal and hernial. Of the 15 cases reported, 7 were intra-abdominal, 8 hernial. As regards the intra-abdominal cases, in 5 of the 6 cases reported by Riedel there is no mention of torsion existing in any of the appendices at the time of operation; in 1 torsion was present; the seventh case is my own, in which torsion presented. In the 8 hernial cases, torsion was observed in 5: Riedel, 2; Muscatello, Krueger, and Lorenz, 1 each; strangulation without torsion was reported in 3 cases—Muscatello, Mohr, and von Bruns.

The intra-abdominal variety of cases may be further subdivided into (1) those in which the distal extremity of the appendix epiploica is adherent, and (2) those cases in which the distal end is loose or non-adherent. Krueger states that torsion of the appendices epiploicæ most likely results from disturbances of equilibrium, excentric development within the abdominal cavity (most cases occurring in fat persons during middle life or later) forming pedicles with hypertrophied distal ends. Circulatory disturbances, caused by progressive narrowing of the pedicle, produce inflammation of the distal extremity, which may result in adhesion to the parietal serosa, mesentery, or intestinal loops, thereby stretching the pedicle into a still thinner band. These bands may give rise to symptoms of obstruction, due to intestinal strangulation.

When the distal portion is free the appendix epiploica may be entirely twisted off, either gradually or suddenly. In both cases free fatty bodies are formed, which may give rise to attacks of pain or peritonitis. It frequently happens that these free bodies undergo calcareous degeneration.

In the hernial group of cases appendices epiploicæ may become incarcerated in femoral or inguinal herniæ, most commonly on the left side. Of the cases reported, 7 occurred on the left, 1 on the right side. In the light forms the acute symptoms may disappear spontaneously, but it seems that the appendix epiploica remains in the hernial sac; it may be loose or it may become adherent and stretched to a thread-like thinness, or it may hypertrophy and be twisted off completely.

Strangulation of the appendix epiploica at the neck of the hernial sac, gangrene due to torsion of the pedicle, or separation of the distal portion of the appendix epiploica causes acute inflammatory conditions, which also involve the hernial sac. The pain is usually violent, frequently radiating to the hypogastrium. When the pain is referred to the back, cecal appendices are involved.

CONCLUSIONS. 1. Torsion of appendices epiploicæ is more frequent than the paucity of references in medical literature would imply.

2. Torsion of appendices epiploicæ usually occurs in persons more or less obese, during middle life and later.

3. Intra-abdominal torsion of appendices epiploicæ may simulate appendicitis, hepatic colic, cholecystitis, and various other intra-abdominal diseases. Torsion of appendices epiploicæ in the hernial sac may cause all the local symptoms of an acute omental or intestinal, femoral, or inguinal hernia.

4. Torsion of appendices epiploicæ may result in corpora aliena adiposa, in adhesions and bands, and their consequences.

5. Corpora aliena adiposa may become infected and cause general peritonitis.

6. In the present state of our knowledge anything more than a tentative diagnosis of torsion of appendices epiploicæ would be rarely possible.

7. Early operation is indicated in all cases.

PRIMARY TUMORS OF THE ADRENAL GLAND IN CHILDREN.

REPORT OF A CASE OF SIMULTANEOUS SARCOMA OF THE ADRENAL GLAND AND OF THE CRANIUM, WITH EXOPHTHALMOS.

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Tumors of the adrenal gland in childhood are not only very rare, but the histology of those that have been reported has not been, as a rule, thoroughly studied. Furthermore, they present in their clinical course differences from the adrenal growths of adults, and tend to fall into rather definite types, with clinical characteristics which may permit of an accurate diagnosis during life. For these reasons we report the following case, remarkable from both the clinical and the pathological point of view.

G. H. C., a male infant, aged sixteen months, entered the Massachusetts Charitable Eye and Ear Infirmary, September 10, 1906, in the service of Dr. Alexander Quackenboss, to whom we express our thanks for turning over the case to us for publication. The family history was excellent, the past history good up to the early part of August, 1906, when a purple discoloration of the upper and lower lids of the right eye suddenly appeared. On August 26 the child was examined by Dr. Myles Standish, who found exophthalmos of the right eye, with diffuse hemorrhagic infiltration of the upper and lower lids; the pupil unresponsive to direct light, but contracting when light was thrown into the other eye. A soft mass over the right temporal region, said to have been present two days, was noted; it measured $1\frac{1}{2}$ x 2 x 3 inches. The fundus was normal.

On entrance to the hospital the ecchymosis of the lids was very marked, with considerable protrusion of the eyeball directly forward. The latter was immobile and vision was apparently *nil;* there was no injection of the conjunctiva. A large flat swelling extended outward from the orbit to the right temporal region, reaching back as far as the ear, and involving the whole temporal region. It was smooth, rather tense, and semifluctuating, the overlying skin not adherent, but showing dilated veins. The corresponding pre-auricular lymph nodes and those at the angle of the jaw were considerably enlarged. The left eye was normal; the nose and throat, heart, lungs, and abdomen were negative on physical examination; the spleen and liver were not enlarged.

Blood examination: leukocytes, 12,000. Smears examined September 17 by Dr. W. H. Smith showed no achromia, and a differential count as follows: polynuclear neutrophiles, 55 per cent.; mononuclears, 44.5 per cent.; eosinophiles, 0.5 per cent.

During the three weeks stay in the hospital, the exophthalmos increased slightly, the temporal growth and the metastases in the lymph nodes grew a good deal larger, and a slight ecchymosis appeared on the lower lid of the other eye. The lids on the right side had become almost black. There was slight injection of the palpebral and the ocular conjunctiva. On September 23 a small piece of the enlarged glands in front of the ear was removed for examination. It was of a bluish color (owing to hemorrhage), and was reported by the pathologist, Dr. F. H. Verhoeff, to be a small round-cell sarcoma.

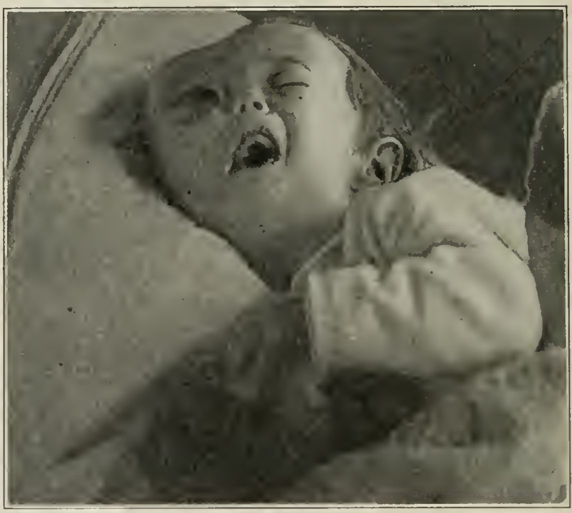
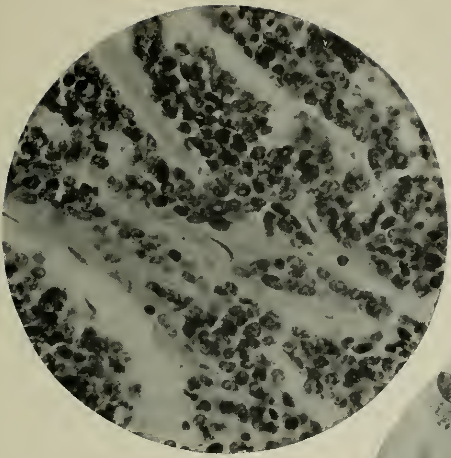


Fig. 1.—Appearance of the child shortly before death.

The patient was given a careful general examination by Dr. W. H. Smith, and later by one of us (Tileston); no abdominal tumor could be made out, although one was looked for. The patient was sent home to West Springfield, New Hampshire, October 2, 1906, and was cared for there by Dr. D. P. Goodhue, to whom we owe thanks for further notes and for obtaining permission for the autopsy. The infant soon fell into a deplorable state, with almost constant pain in the region of the right eye, which almost entirely left its socket, being pushed outward, downward, and inward, so that it nearly touched the nose. The growth about the temple took on huge proportions (Fig. 1), and the cachexia increased. The patient died January 13, 1907.

Autopsy at West Springfield, N. H., thirty-two hours postmortem (Harvard Medical School Series, 3297): The body is that of an



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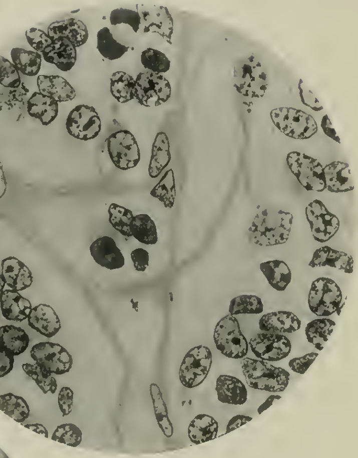

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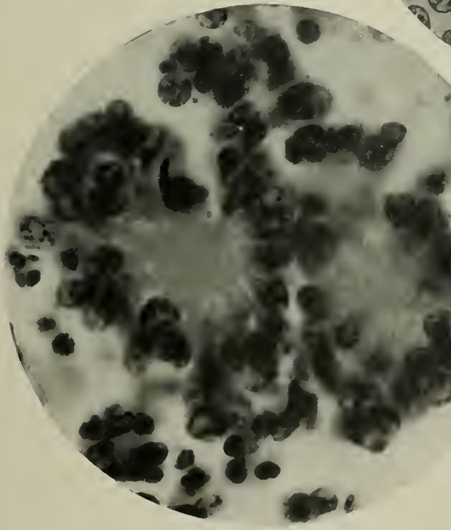

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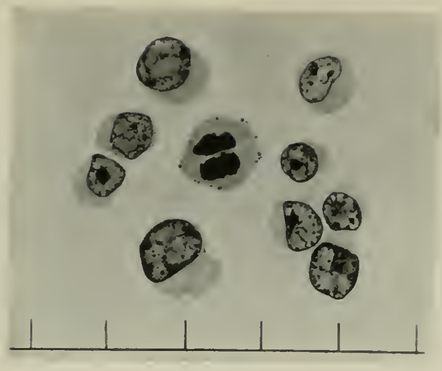
Fig. 2.—Photomicrograph of a section of the tumor, to show the general arrangement in the denser portions. (330 diameters.)

Fig. 3.—Drawing reduced from fifteen hundred diameters, to show the reticular supporting tissue.

Fig. 4.—Photomicrograph of two rosettes. (660 diameters.)



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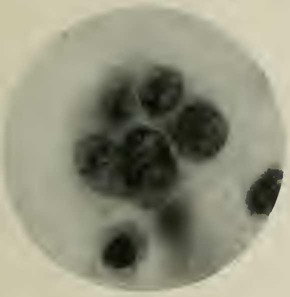

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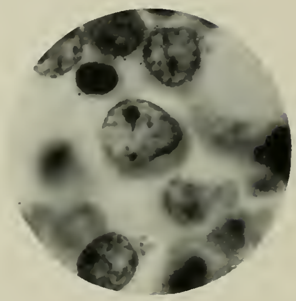

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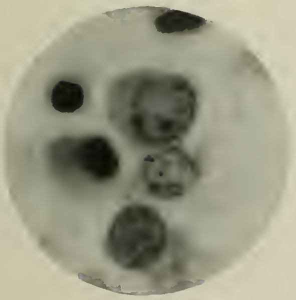

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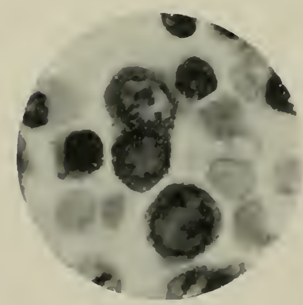

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Fig. 5.—Drawing of single tumor cells, showing the variation in size and also a cell in mitosis. Each division of the scale equals ten microns.

Figs. 6, 7, 8.—Photomicrographs of tumor cells, showing details under high power for comparison with Figs. 5 and 9. (1140 diameters.)

Fig. 9.—Photomicrograph of myelocytes from the erythroblastic liver of an infant. From a case of severe anemia with splenomegaly.

emaciated, poorly developed male infant, 79 cm. long. There is no rosary. The head is greatly deformed and turned to the right. There is marked œdema of lower limbs, penis, and scrotum. The legs are covered with numerous, small, red areas which do not disappear upon pressure. There is a large decubitus on the right hip, exposing the great trochanter, which is denuded of periosteum; and a small decubitus upon the back at the costal angle below the left scapula. There are prominent lymph nodes on the right side of the neck, at the angle of the jaw, and along the sternomastoid muscle; the lymph nodes elsewhere are not palpable.

The deformity of the head is due chiefly to a huge tumor mass on the right side, covering the forehead and frontal bone, and producing great prominence of the zygoma, which is freely movable and pushed forward and downward. The right eye is pushed forward and is directed inward; the sclera is loose; the cornea is clouded. The alveolar process of the superior maxilla is asymmetrical, presenting a greater convexity on the right side. The buccal surface of the palate is convex. The general contour of the right side of the face is convex, due to a diffuse tumor, involving the parotid region as well as the parts described above. There is marked œdema of the scalp and face on the right side. Over the right inferior occipitoparietal angle is a large, rounded, boggy eminence about 11 cm. in diameter. The whole right side of the scalp and face is dark reddish blue in color. The consistency of the tumor over the forehead is soft and elastic, not fluctuating. The following measurements were taken: circumference of head, at level of left frontal eminence 53 cm.; from anterior fontanelle to symphysis of inferior maxilla, right side, 27.5 cm.; left side, 22 cm.; from external auditory meatus to midline, determined by the teeth, right side, 13 cm.; left side, 9.5 cm.

There is no subcutaneous fat and no fat in the omentum, mesentery, and about the kidneys. The omentum is thickly sprinkled with small black dots and irregular black areas, without thickening (old hemorrhages). The peritoneal surfaces are everywhere smooth, moist, and glistening. The colon is inflated in some places; in others contracted and injected about hardened masses of feces. The mesenteric glands are not remarkable. The appendix is normal. The diaphragm reaches to the fourth rib, left; third interspace, right. In the right side of the abdomen, behind the ascending colon, and compressing the kidney and pushing up upon the liver, is an irregular, soft, elastic tumor mass. The shape is roughly that of a flattened ovoid with a broad lateral process crossing the spine. The posterior portion of the right lobe of the liver is flattened horizontally, and is adherent to the tumor. The right kidney is flattened to one-half of its normal thickness, as far down as the junction of the lower and middle thirds. The lower border of the tumor is at the level of the middle of the fifth lumbar vertebra. The inferior vena cava runs through the anterior portion of the tumor, 0.5 cm. below the anterior surface, and lies 4 cm. to the right of the spine and 1 cm. anterior to its normal position; it is flattened and completely surrounded by the tumor mass, as far down as the point where it is crossed by the common iliac artery. In the upper portion of the vena cava just before it leaves the tumor, there is a small flattened, mural thrombus of friable, grayish red clot. The lower portion of the tumor crosses the spine, and lies upon the aorta and pelvis of the left kidney, and compresses both of these structures. The tumor is not adherent to either kidney, and all surfaces are invested with a thin, fibrous capsule. The dimensions of the tumor, measured in situ, are: Vertical diameter, 12 cm.; transverse diameter along the lower portion, 8 cm.; anteroposterior diameter, 8 cm. On section, the tumor is made up of spherical masses of pale, translucent, grayish, soft, elastic tissue, with large areas of hemorrhage and necrosis. In the upper portion the adrenal gland is included. The superior border of the adrenal is intact; the medulla of the bulk of the gland is continuous with the tumor tissue, while the cortex of the lower part diverges to include a dark red, spherical mass, 1 cm. in diameter, and is then gradually lost in the tumor tissue, running for some distance as faint yellow lines. The compressed portion of the liver is not invaded by the tumor. There are several smaller spherical and flattened spherical masses, 1 to 2 cm. in diameter, attached to the various surfaces of the larger tumor. These on section prove to be continuous with the main tumor body, while the external surfaces are covered with a thin, smooth, fibrous membrane.

The pleural cavities are normal; no free liquid; no adhesions. The thymus gland is small; estimated weight, 1.5 grams. The pericardial cavity is normal and the heart is normal in size. The myocardium is of good color and consistency. The valves and endocardium are normal. The foramen ovale is closed. The lungs are uniformly soft, pale, and downy, with the exception of narrow lines of postmortem settling on posterior borders. Bronchial nodes not remarkable.

The spleen is large; length, 6 cm.; breadth, 4 cm. The proportions are normal, and the capsule is smooth. The color and consistency are normal. The liver is 13 cm. in breadth; antero-posterior diameter of right lobe is 9 cm. The posterior portion of the right lobe is compressed by the abdominal tumor described. The color and consistency are normal. The gall-bladder and ducts are normal. The gastro-intestinal tract is normal except for small areas of injection in the colon, in portions contracted about hardened feces.

The pelves of both kidneys are much dilated and contain numerous soft, brownish masses of granular material. Both kidneys smooth non-adherent capsules. The color is normal. The glomeruli are visible. The upper ends of both ureters are slightly dilated. The right kidney has a concave anterior surface, corresponding to the upper two-thirds which was in contact with the tumor mass in the abdomen. This portion of the kidney is about one-half the thickness of the lower third, and slightly broader.

The pancreas, bladder, testicles, and thoracic duct are normal.

The organs of the neck are normal. There is a large mass of soft pink and deep red glands at the angle of the jaw. Those along the sternomastoid are firm, large, and gray.

The femur, vertebræ, sternum, and ribs are normal. All contain red marrow.

The hair of the head is short and sparse; dark-brown. The scalp and skin are much thinned on the right side of the face. The scalp is markėdly œdematous, particularly over the right lower occipitoparietal angle. Beneath the aponeurosis of the whole frontal regions is a soft elastic tumor mass, deepest just below the frontal eminence, where it is 5 cm. deep. Superiorly and laterally the mass gradually diminishes in depth. Inferiorly it is continuous with the tumor tissue on the side of the face and behind the zygoma. The right parietal bone slightly overrides the left, and the parietal suture is studded with small, soft, reddish elevations. The anterior fontanelle is 1 cm. in diameter. On removal of the calvarium, a large, extradural tumor mass is found to fill the whole anterior fossa of the skull. This tumor mass is 6 to 7 cm. deep, and is continuous with the tumor mass on the external surface, through an opening in the frontal bone directly over the orbit. The opening, as near as can be determined, is 2 to 3 cm. in diameter. The adjacent bone is covered on all sides and both surfaces with necrotic and hemorrhagic tumor tissue, and sends innumerable delicate bony spicules into the substance of the tumor. The whole of the tumor within the skull is dark red, in places very soft and necrotic. The orbital plate on the right side is elevated and eroded. All of the accessory sinuses, the antrum of Highmore, and the nasal cavity are filled with dark red, soft, tumor tissue. The internal surface of the dura over the vertex is thickly studded with soft, translucent, grayish nodules, 1 to 3 mm. in diameter. The dural sinuses are normal. The tumor superiorly extends backward between the dura and bone within the skull as far as the lambdoidal suture. On the left side it extends 2 to 3 cm. beyond the median line. The left orbital plate is recessed, and the posterior part of the orbit contains tumor tissue. The pituitary body cannot be found. There is marked deformity of the floor of the skull; the basilar process of the occipital bone is directed inward to the left. The sella turcica is flattened. The general shape of the skull is that of a distorted ovoid, inclining toward the right.

There is marked asymmetry of the brain. The right half of the frontal region slopes obliquely toward the left; the frontal lobe is flattened, as far back as 2 cm. from the tip of the temporal lobe. Both tips of the frontal lobes are flattened and slope obliquely upward

The olfactory processes are small, flattened, and lie parallel with the median fissure, which is directed toward the left. The pia is normal. The convolutions are slightly flattened over the regions already indicated. Elsewhere there is no flattening. The consistency of the brain is moist and soft (postmortem?). Nothing abnormal is found on section of the hemispheres, pons, basal ganglia, medulla, and cerebellum. The vessels at the base are normal.

Anatomical Diagnosis. Sarcoma of the cranial cavity; sarcoma of the right adrenal; emaciation; deformity of the skull and brain, due to a growth under pressure; œdema of the lower extremities due to pressure on the abdominal vessels; mural thrombus of the inferior vena cava.

Microscopic Examination. The following stains were used after Zenker fixation: methylene blue and eosin; Mallory's connective tissue stain; and Mallory's phosphotungstic acid hemotoxylin stain.

Portions of the mesentery containing the dark spots, when treated with potassium ferrocyanide and hydrochloric acid, give the reaction for iron-containing pigment.

The heart, liver, pancreas, adrenal, testicle, and mesenteric lymph nodes are negative.

Spleen. The corpuscles are of good size, symmetrical and abundant, but contain few active cells. The pulp is moderately injected. Both pulp and corpuscles contain numerous polymorphonuclear eosinophiles. A large lymphatic accompanying a branch of the splenic artery at the hilum is tightly packed with small round cells, which on one side are invading the surrounding connective tissue. These cells have round or oval nuclei 5 to 8 microns in diameter. The nuclei stain deeply with the basic stain, and have a coarse basic-staining reticulum, usually with a large chromatin mass at the centre and other smaller masses scattered throughout. The protoplasm cannot always be made out. In places it occurs as a narrow, pinkish, finely granular, eccentric band, without a membrane.

Kidney. The cells of the convoluted tubules are swollen and granular. There are numerous hyaline casts in the collecting and Henle tubules. There are many imperfectly developed glomeruli.

Thymus. The lobules are very small and contain much hyaline connective tissue. The epithelial rests are very small and completely converted into hyaline-like material. There are very few cells resembling lymphoid cells, and the bulk of the cells are spindle-shaped connective tissue cells.

Cerebrum. Temporal Lobe. There is apparently an increase of cells resembling the satellite cells throughout the cortex. The ganglion cells are small; they are usually surrounded by a clear space. The protoplasm is broken up into groups of granular material, and the nuclei are surrounded by clear spaces, so that the cell outlines are indicated by rather narrow fringes of granular protoplasm (postmortem change?). No Nissl granulations are visible. A few ganglion cells contain minute rings of eosin-staining material. The nuclei are deeply stained with the blue; a few are large and vesicular.

Tumor. The arrangement is that of closely packed, small, round cells, supported by a delicate connective tissue reticulum. In places the cell groups are divided by the reticulum into round or irregular and elongated masses (Figs. 2 and 3). In many places the cells are arranged two to four deep in rosette form about masses of eosin-staining, finely granular material; the groups vary from 20 to 70 microns in diameter. This rosette arrangement occurs in all the sections taken from different parts of the growth, in the abdomen, glands, upon the dura, and in the head (Fig. 4). Where the tumor is invading the frontal muscle and adrenal this arrangement ment does not occur. The abdominal mass has completely surrounded the adrenal, and has destroyed the major portion of it, apparently by pressure, as the capsule and cortex are invaded in only a few places. Dilated lymphatics of the adrenal capsule are filled with tumor cells. In some places there is a definite invasion of the cortex with disappearance of the capsule. A lymph node from the angle of the jaw is completely filled with tumor masses, large hemorrhagic foci, and necrotic cells. Here the arrangement is chiefly in rosettes. The reticular structure of the lymph node is present only in places.

Everywhere throughout sections of the tumor from all locations, there is much necrosis of the tumor cells, resulting in hyaline eosin-staining bodies containing one or several irregular-shaped basic-staining granules. The tumor cells are about the size of the largest myelocytes found in erythroblastic centres in bone marrow (Figs. 5, 6, 7, and 8). The nuclei are 5 to 8 microns in diameter. There is very little protoplasm, often none is demonstrable. Usually the protoplasm is eccentrically arranged. It stains purplish, is finely granular, and has no cell membrane, nor granular inclusions. Often the cells of the rosette groups are elongated; the protoplasm is drawn out radially on the central side of the nucleus. Occasionally the nucleus is egg-shaped, with the small end toward the centre of the group. The nuclei, as a rule, are round or oval, and vesicular in appearance. A few show peripherally arranged chromatin masses, but the general distribution of chromatin is a scattered one throughout the nucleus. There is usually a central basic-staining round mass, larger than the scattered chromatin material. The nuclear reticulum is coarsely meshed and very prominent. A few mitotic cells are found. There is evidence of direct nuclear division in the shapes assumed by large nuclei, and the frequent presence of two nuclei in one cell.

The phosphotungstic acid hematoxylin stain reveals no fibrils connected with the tumor cells.

The cells undergoing mitosis are a trifle larger than the other tumor cells; the one illustrated is 10 microns in diameter. The protoplasm is a purplish pink and finely granular. At the periphery of the protoplasm there are usually numerous, small, deeply stained basic granules (Fig. 5). In all portions of the tumor there are many cells with perfectly definite, abundant, coarsely granular protoplasm, with nuclei which are small, densely colored with the basic stain, and separated from the protoplasm by a narrow, sharply demarcated, unstained space. These are probably degenerated cells (Figs. 6, 7, and 8). The reticulum consists of a delicate fibrillar connective tissue, accompanied by large cells resembling those of embryonic connective tissue (Fig. 3).

In all sections of the tumor which include adjacent normal tissues, the veins and lymphatics of the latter contain clumps and often rosettes of tumor cells. In the dura there are tumor cells in the veins, from which invasion of the tissues is apparently taking place.

The marrow from the femur shows normal active marrow, with many small groups of tumor cells, ranging in size from closely packed groups of six to ten cells, to masses 1 mm. in diameter, showing the characteriste groupings and type of cells occurring elsewhere in the tumor.

Summary and Classification of the Tumor. In this case the striking pathological feature is the finding of large identical tumors in the abdomen, involving only the adrenal, and in the cranium, involving only adjacent soft tissue and lymph glands. In spite of the frequent finding of tumor cells in the bloodvessels and lymphatics, metastases were found only in the bone marrow and the lymph nodes of the neck. The slight tendency to invasion is shown by the presence of a large portion of intact adrenal in the abdominal tumor mass, and in the flattening of the liver and kidney, without extension into either. The tumor is a small round-cell sarcoma. belonging to the type in which the cells are supported by a reticulum. The cells resemble the undifferentiated cells of the bone marrow.

In the classification of this tumor, it should unquestionably be placed in that group of tumors which includes all those derived from the blood-forming cells, both white and red. Ribbert has proposed the name lymphocytoma for this group, which includes all those tumors called malignant lymphoma (lymphosarcoma, malignant lymphadenoma, etc.), chloroma, myeloma, and possibly the leukemias. The essential features of this group are the reticular supporting tissue, and the type of tumor cell, which represents a more or less incompletely differentiated cell belonging to the blood forming series.

Two characteristic tumors of this group present cells in which the type is readily recognizable; the myeloma, in which the cells resemble very closely certain cells found normally in the bone marrow and probably identical with plasma cells, and the lymphoma, in which the cells resemble either differentiated lymphoid cells, or the cells of the germinal centres of lymph follicles.

The peculiar grouping of the tumor cells in rosette arrangement, shown in Fig. 4, deserves consideration. Unlike other tumors in which there is a rosette arrangement, certain gliomas, for instance, there is no attempt at lumen formation. In no instance could vessels or connective tissue, or remains of either, be found in the centres of these groups. The examination of many sections has proved the shape of these clumps of cells to be roughly spherical or ovoid, thus excluding the possibility of columnar growth about a supporting tissue, which in cross section might give such an appearance.

While these rosettes are found in all portions of the tumor, they are most common in those parts where there is least supporting tissue, and are found even in the metastatic masses of cells within bloodvessels. The possibility of an agglutinative phenomenon is perhaps worthy of mention, because of the suggestion that the cells, in the absence of a supporting tissue and because of the very soft consistency of these portions of the tumor, were suspended in a liquid or semiliquid medium. This is also suggested by the presence of a very fine granular deposit, which stains lightly with eosin, resembling that thrown down by Zenker's fixative from liquids containing albumin. The granular central substance of these clumps can also be explained by this hypothesis, while it is otherwise difficult to account for it, because in the absence of nuclear remains, it is not probable that it is derived through the degeneration of cells.

Another perhaps more plausible explanation is that the tumor cells, after multiplication, have failed to separate from one another, and by their cohesion produced the rosette arrangement. Until a number of tumors similar to this one have been accurately described it is best not to attempt to select a descriptive name.

For clinical purposes, tumors of the adrenal gland in children may be divided into four classes: (1) Those with metastases to the skull (Hutchison's type); (2) those of simultaneous sarcoma of the liver and adrenal; (3) those associated with precocious maturity; and (4) those not falling under any of the preceding headings.

It is in connection with the first of these types that the foregoing case is important. Hutchison has recently called attention to this new clinical syndrome, and has reported 10 cases, 6 hitherto unpublished, and 4 from the literature. In view of the rarity and great interest of this condition, it has seemed desirable to collect and analyze as many cases as possible. We have reviewed the literature carefully, and have succeeded in adding 4 new cases to the list, while we have left out one of those included by Hutchison (that of Ogden and Mathews), for reasons that will be given later. This brings the total number of cases reported up to the present time, including our own, to 14.

The following description applies to Hutchison's type of adrenal tumor (the others will be considered later). This syndrome has been found hitherto only in infants or young children, and shows the following characteristics: Spontaneously or after trauma there appears ecchymosis of one or more eyelids, soon followed by exophthalmos, which is usually one-sided. The eye becomes more and more protruded, and there appears a growth in the adjacent temporal region, with enlargement of the lymph nodes in front of the ear and at the angle of the jaw. A tumor in the region of the kidney is felt during life in the minority of cases (6 out of 14); most frequently, as in our case, it constitutes one of the surprises of the postmortem table. The orbital tumor grows with great rapidity, and death ensues early from cachexia and anemia. Optic neuritis may occur, but total blindness is the exception. Pain in the head is frequent, but vomiting, in spite of the extension inward toward the brain, is rare. The abdominal growth may be quite large, and is then accompanied by swelling of the superficial abdominal veins, but never by ascites. Fever is usually absent. The urine, in the few instances in which it has been examined, has been free from blood and albumin, except in Aisenstein's case, in which albuminuria was present. The blood shows a secondary anemia, which may become extreme; there was reduction of the red cells to 1,400,000 in one case. The white cells are not increased, but there is usually a relative decrease of the polynuclear neutrophiles; whether the increase in basophiles affects the lymphocytes or the cells probably originating in the bone marrow (pre-myelocytes and allied forms) does not appear from the details reported, polynuclears only being mentioned.

The early age of the patients deserves especial emphasis. Twelve of the 14 were not over three years of age; 4 were under one year; 2 between one and two years; 6 between two and three years; only 2 were over three years; the eldest being nearly nine years old. The male sex predominated, with 9 boys to 4 girls (the sex is not stated in one case).

Pathological Anatomy. The adrenal growth varies from the size of a walnut to that of a child's head. It is usually one-sided, the right and the left side being involved with almost equal frequency. On section the surface is smooth, gray-white or yellow, and mottled with hemorrhages. There is little tendency to invade the neighboring tissues and organs. Metastases to the calvarium were present in all cases, to the ribs in 4, to the spine and tibia in 1 each; in 1 case the bone marrow and periosteum of several of the long bones were involved. In this connection it is interesting to note that of the cases of primary adrenal growths in children in the literature, in which the cranium was not involved, not one showed metastases to other bones, with the exception of Caillé's[1] case, which is incompletely reported. In Cohn's case, besides the cranial growths, almost all the ribs showed metastases at the junction with the costal cartilages, presenting a picture like that of rickets, and as he points out, the great vascularity and rapid growth of these parts in infants may well be the reason for the preference shown to the skull and ribs in both diseases. In spite of the large size of the growths in the skull, the brain is not invaded. Of other organs, the liver, kidneys, and lymph nodes were most often the seat of metastases; the ovaries once.

Histology. These tumors are almost invariably sarcomas; in 3 cases only was another diagnosis made, that is, hypernephroma twice, and melanotic carcinoma. Five of the 14 showed practically the same structure, being classed either as small round-cell sarcoma (3 cases), or as lymphosarcoma (2 cases). Three are described as "round and oval-cell sarcoma," 1 as "medullary sarcoma," and 1 simply as "sarcoma." One case is reported without microscopic examination.

In view of the rarity of the condition, we shall give a brief description of the cases hitherto reported, in chronological order. The 6 original cases of Hutchison are designated by the numbers they bear in his table.

CASE I. Cohn. Female child, aged nine months. First symptoms, "boil" on the right temple and exophthalmos of the right eye; soft semifluctuant flat tumor in the right temporal region attached to the bone; five similar smaller tumors behind the left ear; deep in the right flank a tumor not connected with the liver; spleen and liver enlarged; no blood or albumin in the urine; tremendously rapid growth of the cranial and abdominal tumors; great enlargement of the occipital and deep cervical lymph nodes; no fever; death in five weeks. At autopsy a large tumor of the right adrenal, with secondary nodules in the right kidney, liver, ovaries, and most of the ribs at the junction with the costal cartilages. Virchow diagnosticated "medullary sarcoma," primary in the adrenal.

CASE II. Reimann. Female infant, aged three months at the onset; first symptom, subcutaneous nodules of a bluish color; these did not increase in size, but fresh ones continually appeared; no exophthalmos, but two small periosteal tumors on the parietal bones; death at the age of seven months. At autopsy primary tumors of both adrenals, very numerous metastases in the bones, subcutaneous tissues, muscles, dura mater, and liver; metastases in both parietal bones, in the marrow of the long bones, and also in the periosteum of these bones. Chiari made the diagnosis of melanotic carcinoma; microscopically the tumor consisted of round and

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[1] Archives of Pediatrics, 1895, xii, 594.

"epithelioid" cells arranged in islands separated by connective-tissue septa, and bearing large masses of granular pigment.

Case III. Barnard (Case V of Hutchison). Boy aged two and one-half years; fall on the head six weeks previously; next day cheek and eyes swelled; on examination entire head enlarged, both eyes forced out of their sockets, soft tumor masses on the forehead; in the left hypochondrium an irregular tumor lying deeply, with the intestine in front of it. Red cells, 3,200,000; whites, 8400; polynuclears, 47 per cent. The correct diagnosis was made during life; at autopsy sarcoma of the left adrenal, infiltration of the calvarium with newgrowth, a small metastasis in the liver.

Case IV. Aisenstein. Boy, aged two years. First symptoms, anemia, loss of weight, pain on walking or standing. Fever throughout the disease. Albuminuria, dulness in chest due to enlarged mediastinal glands. A month after admission hemorrhage into left eyelid. Hemorrhagic pleural effusion. Lateral displacement of lower dorsal vertebræ. Finally large tumor on frontal bone, large deep-seated mass in region of stomach, small scattered round tumors in abdomen. Marked anemia; death at the end of three and one-half months. Clinical diagnosis, tuberculosis. At autopsy large tumor of left adrenal, with numerous metastases to the skull and ribs, also to the abdominal, mediastinal, and cervical lymph nodes, and to the pancreas. Microscopically oval and polygonal cells with alveolar arrangement; the tumor is classified as an alveolar sarcoma or endothelioma, belonging to the hypernephroma group.

Case V. Bruck. Female, aged one year and two months; first symptom pain in the abdomen with swelling, then discoloration and swelling of the right eyelid; no exophthalmos. Tumor of the liver reaching nearly to the anterior superior spine of the ileum. Exploratory operation; death the same day. At autopsy a tumor of the right lobe of the liver the size of a child's head, and of the right adrenal the size of an apple; smaller tumors on the upper wall of the orbit, and in the dura of the frontal bone. Tumors of liver and adrenal not continuous; pancreas involved by extension. Microscopic examination, small round-cell sarcoma.

Case VI. MacCarty. Child (sex?), aged two and one-half years. Eight weeks before entrance to the hospital a small "boil" on the left side of the head. Soon after, right exophthalmos, enlarged glands behind the ear and in the left axilla; abdomen distended. A small tumor in the jaw appeared, following the extraction of a tooth. On examination a fluctuant tumor the size of a large apple in the left parietal region; a smaller tumor in the left axilla; right exophthalmos; liver three fingers' breadth below the ribs; spleen palpable. Blood: polynuclears, 70 per cent.; lymphocytes, 27 per cent.; eosinophiles, 3 per cent. Anemia; no nucleated red cells, some macrocytes and poikilocytes. Fever throughout the course of the disease, death in ten weeks. At autopsy a tumor of the right adrenal the size of a child's head; diagnosis, "malignant hypernephroma." Four metastases in the cranium, one very large, with complete erosion of the bone; metastasis in the axilla.

CASE VII. Richards (Case XXX of Richards' series). Male, aged six months. At the age of two months a lump appeared at the posterior fontanelle, and reached the size of a small orange; a similar tumor destroyed the right eye. Tumors also in the arm and leg. The autopsy showed three tumors of the calvarium, projecting both inward and outward, and covered with a thin shell of bone; other metastases in the fifth and sixth ribs, bronchial glands, liver, subcutaneous and muscular tissues of the arm and leg. Primary tumors 4 x 3 inches in both adrenals; histologically small round-cell sarcoma.

CASE VIII. Hutchison (I). Boy, aged eight years and nine months. Ecchymosis of left eye, headache and vomiting since a blow on the forehead five months before admission. Left cervical glands enlarged. A tumor in the left loin. The left eye later became protruded and the cornea destroyed. Tumor on the left tibia. Death in six months from onset. Autopsy: large tumor involving left kidney and left adrenal; calvarium infiltrated with growth. No secondary deposits elsewhere.

CASE IX. Hutchison (II). Boy, aged ten months. Swellings on the head first symptom; left eye protruded; hemorrhage into the orbit; provisional diagnosis scurvy. Died soon after admission. Reds, 3,125,000; whites, 12,000; no abnormal white cells. Autopsy: small round-cell sarcoma of the medulla of the left adrenal; calvarium and cervical glands infiltrated. No secondary deposits elsewhere.

CASE X. Hutchison (III). Boy, aged two and one-half years. Lumps noticed on the head five months before admission. Tumors of the forehead and temporal fossæ, ecchymosis and protrusion of the right eye-ball. The liver enlarged. Died six weeks after admission. Reds, 1,572,000; hemoglobin, 45 per cent.; whites, 14,500; polynuclears, 31 per cent. Autopsy: the right adrenal contained a tumor the size of a walnut. Secondary nodules in the liver and cervical glands; extensive growths in the calvarium and base of the skull. Microscopically, round- and oval-cell sarcoma.

CASE XI. Hutchison (IV). Girl, aged four years. Pains in the limbs and head for six months; great weakness. Tumor in the left hypochondrium. After admission optic neuritis, lumps on the forehead, and left-sided exophthalmos. Died three and one-half months after admission. Reds, 3,942,000; hemoglobin, 70 per cent.; whites, 10,500; polynuclears, 51 per cent. Autopsy: large nodular growth of the left adrenal, deposits in the lymph nodes all over the body, in the bones of the skull, and on the inner aspects of all the ribs but the first. The growth consisted of round and oval cells; the diagnosis was sarcoma or papilloma.

Case XII. Hutchison (VI). Boy, aged three years. Ill two weeks, but pale for a considerable time. Hemorrhage from the gums. Growth in the left temporal fossa, slight exophthalmos. Optic neuritis, blindness. No tumor felt in the abdomen. Urine normal. Died nine weeks after the onset. Reds, 1,400,000; hemoglobin, 35 per cent.; whites, 8000; polynuclears, 65 per cent. Autopsy: sarcoma of the medulla of the left adrenal; infiltration of the calvarium and thoracic spine. Microscopically, round and oval-cell sarcoma.

Case XIII. Hutchison (X). Boy, aged three years. Blackening of the left eye four weeks before admission; no history of injury. Double exophthalmos; both upper lids blackish; hemorrhage into the left conjunctiva. Ovoid elastic tumor on the right parietal bone and a rounded prominence above the right ear. Profound anemia. Spleen palpable. Urine normal. The abdomen became tender, but no tumor was felt. Died four weeks after admission. Autopsy: large tumor of left adrenal; the entire surface of the skull covered by huge masses of newgrowth, containing spicules of bone; invasion of both orbits. No deposits elsewhere. Microscopically, lymphosarcoma.

We have left out the case of Ogden and Mathews,[2] included by Hutchison in his table, on the ground that the adrenal origin, although probable, was not certain. The cranial metastases were, to be sure, quite characteristic, but the abdominal growth consisted of a large retroperitoneal mass involving the liver and upper pole of the kidney, no mention being made of the adrenal gland. Although this case, as well as those of Moreau[3] and Oshima,[4] may well have been of adrenal origin, the proof is lacking, and we believe it to be safer, in seeking to establish a new clinical syndrome, to keep to well established instances.

Reimann's case differs somewhat markedly from the others, both in the presence of melanotic pigment, and in the multiplicity and small size of the metastases. The diagnosis of carcinoma is open to question, such growths being more usually styled sarcomas, but the histological details are not complete enough to admit of exact classification. We have included it because the primary tumor was in the adrenal gland, and metastases to the skull were present, although small and not located in the orbit.

After this review of the literature, the question as to which of the tumors in our case was primary can be considered to better advantage. The identical histological appearances render it certain that all were of the same nature. The primary seat, however, cannot be decided from the gross or microscopic picture, for the cranial and abdominal tumors were both large, and the tumor cells showed no

[2] Brit. Jour. Childr. Dis., 1906, iii, 394.

[3] Bull. de la Soc. Anat. de Paris, 1852, 239.

[4] Wien. klin. Woch., January 24, 1907, 93.

resemblance to adrenal tissue. It is well known, however, that a small tumor may give rise to enormous metastases, and in view of the inaccessible position of the adrenal, the failure to palpate the tumor during life is of no importance. Several lines of argument, nevertheless, lead us to regard the adrenal tumor as the primary one.

In the first place, we have been unable to find instances in which a primary tumor of the cranium has caused metastases to the adrenal gland; and enlargement of the pre-auricular glands, so constantly met with in the group of cases under consideration, is exceptional in sarcoma of the orbit.[5]

Another point in favor of the adrenal origin is the well-known predilection of adrenal tumors to metastasize in the bones. This is especially true of the hypernephromas of adults, of which Scudder, in 1907, collected 17 instances with bone metastasis, to which we have been able to add 34 more, bringing the total up to 51. The great frequency of bone metastases in these tumors is even better brought out by a study of the cases followed to autopsy; thus, Albrecht found them present in 5 out of 11, and Böhler in 5 out of 10 autopsies. The relative frequency of bone metastases is, therefore, probably greater in the case of adrenal growths than in tumors of any other organ. The hypernephroma of adults, however, rarely causes exophthalmos, the metastases being situated in the skull fairly often, but almost never in the orbit (1 case of the 51 with bone metastases).

It would not do, however, to lay too much emphasis on the occurrence of bone metastases in hypernephroma, for this type of tumor shows a structure resembling that of the adrenal gland, and the group in question does not. It is very possible that the frequency of bone metastases might be because of the nature of the growth, not because of the location. For tumors of the lymphocytic series have a tendency to metastasize in tissues of a similar nature, that is, in the bone marrow and lymphoid structures. And the cells of the tumor in our own case resemble closely the myelocytes found in erythroblastic centres in bone marrow.

The final argument is derived from a critical study of the cases in the literature. No less than six, or almost one-half (Cases VI, VIII, IX, XI, XII, and XIII), show involvement only of the adrenal, the bones, and the lymph nodes. If it were assumed that the orbital tumor was the primary one, it would surely be very remarkable that it should in so many instances give metastases only to the suprarenal gland of all the viscera, whereas in the case of one form of adrenal tumor, the hypernephroma, solitary metastasis to the bony system is well established. Furthermore, in Richards' case both adrenals were the seat of tumors, which again would be exceptional on the assumption of metastasis, while the involvement of both glands in primary growths is not uncommon.

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[5] Cf. Lagrange, Tumeurs de l'œil et de l'orbite., Paris, 1904, vol. ii.

We, therefore, regard the adrenal tumor as primary in our case, which resembles closely those hitherto reported; Case XIII, in fact, appears identical with ours in every respect.

It remains to give a brief consideration of the other forms of adrenal tumor occurring in children. The second type, already referred to, is that of simultaneous sarcoma of the liver and adrenal. It has been well described by Pepper, and is met with as a congenital tumor in the first weeks of life; clinically there is enormous enlargement of the liver, without ascites, and, as a rule, without jaundice. The liver is sometimes involved alone, usually in company with the adrenal. Histologically there is in all instances a diffuse infiltration with small round-cell sarcoma.

The third type is extremely interesting with regard to the relation of the adrenal glands to the growth of the body, and to sexual development. The disease is chiefly seen in girls of one to eight years of age, and runs a comparatively slow course, usually of several years' duration. These children present a very remarkable appearance, the face and pubes being covered with an abundant growth of hair, and the external genitalia as fully developed as in the adult. They are obese and abnormally large for their age, a child of five years having the size and general appearance of a boy of sixteen (Linser's case). Pigmentation of the skin may occur, but the color is more like that of a brunette or gypsy than like the bronzing seen in Addison's disease. The intellect is dulled and the disposition sullen. Appetite, and sometimes thirst, are increased, and vomiting is likely to be an obstinate feature. The urine may contain albumin, due to the presence of blood, but sugar is absent. At autopsy a tumor of the adrenal gland is found, which is usually large, reaching up to 3 pounds (Fox's case).

Almost all of these tumors which have been examined histologically have shown a structure more or less resembling that of the normal adrenal gland, and, therefore, come into the group of the hypernephromas. This is important, as indicating the possibility of an increased adrenal secretion in these cases. And, indeed, in three instances (Otto,[6] Crecchio,[7] Marchand,[8]) premature development has been associated with simple hyperplasia of the adrenal glands.

Either precocious maturity, or giant growth, or both, have been found also in tumors of the pituitary and pineal glands, of the testes and ovaries; and retardation of growth has been associated with lack of development of the thyroid (cretinism), and of the adrenal glands. For this and other reasons all these glands may be assumed to have an intimate physiological connection with one another (Linser). Lack of space, however, forbids a further discussion of this interesting subject, fully dealt with in the articles of Linser, and Bullock and Sequeira, to which the reader is referred.

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[6] Path. Anat. Beobacht., 1816, 139. Quoted by Lancereaux. Dict. Encycl. d. Sciences Méd.

[7] Wien. med. Presse, 1866, Nr. 30, p. 763.

[8] Internat. Beiträge zur Wiss. Med., 1891, Band i. Festschrift f. Rudolf Virchow, p. 554.

Other tumors of the adrenal (Group IV) occur in children, but they show no distinctive clinical features, and, therefore, do not require a detailed consideration here. Sarcoma, carcinoma, glioma, and hypernephroma without precocious maturity, have all been observed. Rachmaninow[9] has reported several cases of mixed tumors of the adrenal, but the kidney was involved in all, so that they are more properly to be classified with the "congenital adenosarcoma of the kidney" described by Birch-Hirschfeld.

Diagnosis. Tumors of the orbit in infants and young children should arouse the suspicion of metastases from an adrenal growth, and the abdomen should be carefully palpated; an abdominal tumor if present is almost sure to be of adrenal origin; the presence of enlarged pre-auricular glands renders primary sarcoma of the orbit unlikely. Chloroma presents almost identical growths, being associated with tumors of the orbit in two-thirds of the cases, with exophthalmos usually as the first symptom. It may be excluded by the absence of leukemic changes in the blood. Myeloma may cause bony growths about the skull, but is exceedingly rare in childhood; the presence of the Bence-Jones body in the urine would render the diagnosis of myeloma certain, while its absence is not conclusive.

An abdominal tumor associated with precocious maturity is practically certain to be of adrenal origin, if tumors of the ovaries or of a retained testis can be excluded. Other adrenal tumors in most cases cannot be distinguished from tumors of the adjacent tissues, especially of the kidney.

Treatment. The only hope lies in early radical removal, but unfortunately these tumors usually pass unnoticed until either their great size or the presence of metastases attracts attention, and then it is too late, as a rule, for a successful operation.

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CONGENITAL ABSENCE OF THE GALL-BLADDER.

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Mrs. M. was admitted to the Columbian Hospital July 19, 1907, with the following history: She was fifty-four years of age, had been sick from time to time during the past five years, and had a severe attack of typhoid fever ten years ago. At the beginning of her present illness she had symptoms of gastric ulcer. The gastric pain subsided, and later she had well-marked discoloration of her skin and other evidence of obstruction of her bile-ducts. Her appearance indicated poor nutrition, with marked anemia, and evident mischief about the gall-bladder or bile-ducts. On examination a mass could easily be outlined; this was thought to be the gall-bladder, and we were confident that several stones would be found. Operation was done on July 20, and the following conditions were observed: The gall-bladder was conspicuously absent, and the duodenum and pylorus were elevated and appeared to be attached along the notch which is usually the seat of the bladder. We soon located the stones, but were surprised to find them in what proved to be the hepatic and common ducts. It was necessary to divide the mesentery of the duodenum to reach the stones. Two stones were removed from the common and six from the hepatic duct. Both ducts were largely dilated. The stones were about the size of filberts. After removing the calculi we made a very careful search for the missing gall-bladder but without success. We discovered a papule very near the site of the cystic duct. Careful probing through the open hepatic duct failed to locate any vestige of the cystic duct. Although the patient had been sick for many years, there had been no well-marked attack of gallstone colic. The evidence of cholecystitis, with the resulting adhesions, was not present, and we were not confronted by the results of inflammation, as is so often the case; but, as we have already stated, the anatomical defects were distinctly peculiar. It was necessary to open the ducts widely in order to extract the stones. The patient had a slow recovery, due to loss of bile and poor nutrition. This was further complicated by a duodenal ulcer, which reached its climax on the twenty-eighth day, when a severe hemorrhage nearly proved fatal. The bile ceased discharging from the wound in twenty-four days; recovery progressed rapidly from this time, the patient having fully recovered, and being able to leave the city for home at the end of six weeks.

Absence of the gall-bladder is comparatively rare, but we find that a number of well-authenticated cases have been reported. Gay[1] has collected 19 cases, in 6 of which "absence" was the only abnormality. In 5 of these the patients were from twenty-five to sixty-five years of age. As may be supposed, the majority of cases are seen in young children and at the postmortem table. (See Eshner.) Nearly all of the important information upon the subject will be found in the articles by F. Fink[2] and A. Bubenhofer.[3] It is important that these cases should have careful inspection, and rigid search be made for apparently absent gall-bladders. Mistakes are made by men of more than average experience. It may be taken for granted that in the presence of severe inflammatory changes the gall-bladder is merely lost from view or mistaken for one of the ducts. I have on more than one occasion had to open the common and hepatic ducts before clearing up a case of doubtful diagnosis. The deeply planted gall-bladder, which has shrunk to the size of one of the ducts, is especially difficult to locate.

It is important that we should know that the absence of the gall-bladder is not necessarily a serious matter. Several of the lower animals do very well without such a viscus. The elephant appears large enough to need one, but does well without it. The deer, goat, and other animals are likewise not supplied with gall-bladders, yet we are not aware that they suffer from any of the results of gallstone or biliary disease. Finally, we note in the literature the uniform testimony regarding the dilatation of the bile-ducts in these cases. This may be due to obstruction alone, or it may be a compensatory dilatation of the hepatic duct, as may be seen after certain cases of cholecystectomy.

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[1] Trans. Chicago Path. Soc., 1902, v, 108.

[2] Ein Fall von Vortauschung der Gallenblase, Prag. med. Woch., 1904, xxix, 245.

[3] Ueber einen Fall vonkongenitalen Defekt (Aganese) der Gallenblase, Anatom. Beiträg., Wiesbaden, 1904–5, xxvii, p. 305.

REVIEWS.

Diseases of the Breast, with Special Reference to Cancer. By William L. Rodman, M.D., Professor of Surgery in the Medico-Chirurgical College of Philadelphia, and the Woman's Medical College of Pennsylvania. Pp. 385; 69 plates; 42 other illustrations. Philadelphia: P. Blakiston's Son & Co., 1908.

This is an interesting, accurate, and valuable addition to the literature of mammary surgery. Dr. Rodman's work shows thorough familiarity with the history of the various operative procedures, a full understanding of their most modern modifications, and extensive personal experience. If occasionally somewhat radical in his teachings—*e. g.*, in the advocacy of the removal of the pectoralis minor in all cases of carcinoma mammæ, and the exploration of the supraclavicular space in the majority of cases—it must be admitted that it is safer to err in this than in the reverse direction.

As a rule, the author's dicta represent the best recent surgical opinion, and may safely be followed. He is certainly correct when he says: "In suppuration the danger consists not in doing too much, but in doing too little. Early and free opening of the affected parts will invariably give satisfactory results, whereas delay, procrastination, and loathness to use the scalpel freely, when it is employed will be followed by extensive destruction of tissue."

His mention of the possible advantage of the "opsonic" treatment in tuberculosis of the breast is properly conservative. It is true that "there is no reason to doubt that it would do good in this form of the disease as well as in others," but it is also true that "it should not be used as a substitute for operation, which has been proved to be efficacious, but as a supplement to operation, with the view of hastening recovery by increasing the opsonic power of the blood."

The advice to practise plastic resection of the gland in cases of cyst, but to have an immediate examination—*i. e.*, while the patient is still anesthetized—of the affected tissue, and to proceed to full excision if carcinoma is present, is sound. Many breasts are uselessly sacrificed, on the one hand, and no small number of patients, on the other, from failure to appreciate and follow this excellent rule.

In the treatment of keloid, the use of the *x*-rays as preliminary to operation is wisely recommended, but no mention is made of the occasional benefit following the administration of thyroid extract in such cases, or, at least, in cases of hypertrophied cicatrix, clinically indistinguishable from keloid.

In considering the etiology of carcinoma the author perhaps follows too implicitly the teachings of Orth, and correspondingly minimizes the strength of the arguments for classing cancer with the infectious diseases. He might also, in spite of the statistics of Williams, have safely been more positive as to the influence of trauma and chronic inflammation in favoring the development of cancer, especially in view of the fact that he himself mentions that "all forms of carcinoma are generally found at points subject to persistent irritation."

He is certainly right in condemning the preliminary use of x-ray treatment before operation, and most surgeons will agree that the "practice cannot be too pointedly condemned, inasmuch as it has been productive of little, if any, good, even in a minority of cases, and in all wastes valuable time—possibly allowing internal metastases to occur before operation is instituted." But in superficial recurrences, and in inoperable sarcomas, some benefit—occasionally great benefit—may be expected, and in rare cases of inoperable cancer there have been relief from pain and shrinkage of the tumor. This coincides with the experience of surgeons everywhere.

The illustrations are excellent, especially those explanatory of the operative methods, and the physical features of the book are very attractive. The author is to be congratulated on both the contents and the appearance of the book, which is sure to be well received by the profession. J. W. W.

MODERN CLINICAL MEDICINE. DISEASES OF THE NERVOUS SYSTEM. Edited by ARCHIBALD CHURCH, M.D. An authorized translation from *Die Deutsche Klinik,* under the General Editorial Supervision of JULIUS L. SALINGER, M.D. Pp. 1205. New York and London: D. Appleton & Co., 1907.

THIS is a rather imposing volume of 1200 pages. It suffers from the ordinary defects and advantages of a book written by many authors. Certain parts of the general subject of nervous diseases are omitted or treated too briefly, others too fully, and there is a moderate amount of repetition. On the other hand, certain phases of the subject, which should probably be omitted from a text-book, are treated with detail, and some of the articles are written by men thoroughly familiar with the subject from long years of more or less special devotion to it and form monographs of permanent value. The English translation is fairly good. The style varies less than in the German original, which is an advantage. The fact that some of the articles are written in a distinctly more conversational or lecture style than otherwise does not seem to render them in any respect easier to read. There is an adequate number of illustrations, the majority of which are of value in elucidating the text. Many of them are diagrams or reproductions of tracings, but not a few are pictures of pathological specimens or of patients illustrating the symptomatology of disease or the application of different forms of mechanical treatment. The colored illustrations are perhaps on the whole the least successful, although many are excellent. Colors have also been used for the purpose of making some of the diagrams clearer. The brief, first section upon the macroscopic anatomy of the central nervous system, by Rothmann, is clear and considers the subject to a certain extent from a clinical standpoint. In the section on histology, Rosin, as was to be expected, introduces a good many descriptions of the staining methods. The article, however, is excellent, even if somewhat too scientific for a clinical text-book on nervous diseases, and it is admirably illustrated. He accepts the neuron theory unreservedly, and classifies the various diseases of the central nervous system according to the different neurons involved with a separate division for the inflammatory conditions. In the limits of a brief review it is not possible even to notice all of the individual articles. It may be noted, however, that the section on general neurological diagnosis, by Schuster, is rather unsatisfactory, the part on the significance of the reflexes being particularly inadequate. Modern aids in the diagnosis of diseases of the brain is a curious paper, that might have been extended with advantage, and includes a description of lumbar puncture, which, as treated separately by Quincke, is the most admirable article in the whole book, its value being enhanced by a very full bibliography. Wernicke writes on aphasia. The article is entirely according to the old school, and does not discuss the modern views of Marie. Gutzmann gives a very excellent account of the disturbances of speech, with some curious tables and diagrams. The article on tumors of the spinal cord is merely adequate; that upon myelitis and particularly the article on tabes dorsalis, by Erb, are masterpieces. The latter is written in the breezy controversial style peculiar to the author, and is most thorough in every department.

Among the other articles of distinct excellence are that upon heredity ataxia, by Lüthje; on the paralysis of the peripheral nerves, by Bernhardt, practically a condensation of his larger work; and upon neuritis and polyneuritis, by Kassirer. Edinger discusses headache, and Erb gives an excellent account of paralysis agitans. Franckl-Hochwart discusses athetosis, tetany, and myatonia congenita. Remak's article on localized spasm is interesting because it presents rather clearly the little that is definitely known about this condition. Eulenburg, in his article upon exophthalmic goitre, justly condemns sympathectomy in the treatment. His article on sexual neurasthenia is on a par with most of the articles upon psychopathia sexualis, exalting the subject and drawing conclusions from insufficient data. Hysteria, by Ziehn, is very good, but the remaining articles on epilepsy, traumatic neurosis, occupation neurosis, and cerebral hemorrhage and embolism have been written hastily and are not worth the company they keep.

J. S.

Obstetrics. A Text-book for the Use of Students and Practitioners. By J. Whitridge Williams, Professor of Obstetrics in the Johns Hopkins University; Obstetrician-in-Chief to the Johns Hopkins Hospital, Baltimore. Second edition; pp. 950; 682 illustrations. New York and London: D. Appleton & Co., 1908.

From our careful reading of the first edition of this work we were confident that the profession would afford it a gratifying reception. This prophecy has been justified by the appearance of the second edition at this early date. In our original review we gave it as our opinion that, as a scientific exposition of the subject in English, the work of Dr. Williams stands alone. We have no reason to be less emphatic after the study of the present volume. There are some views with which we are not in accord, and there are certain procedures, proved by ample experience to be valuable, which could have been included with advantage. Thus we think that the premature induction of labor, in the presence of moderate contractions of the pelvis, cannot in all fairness be dismissed by a negation. Furthermore, we can not look upon the method advised for the closure of the uterine wound after the Cesarean operation as the best possible, and finally we would suggest that a description of the Voorhees and Pomeroy bags be included, even if those of Champetier-de-Ribes and Barnes are considered preferable by the author. We simply mention these instances as explanatory of our previous sentence. On the other hand, it gives us pleasure to reiterate our enthusiastic opinion of the book as a whole and to call attention to the most marked changes and additions which this edition presents. These, as stated in the preface, consist chiefly in an entire rewriting of the chapters upon the development of the ovum and upon the toxemias of pregnancy, together with the addition of sections in which the metabolism of normal pregnancy, vaginal Cesarean section, pubiotomy, and contractions of the pelvic outlet have been considered. We would especially call attention to the chapter upon the toxemias of pregnancy, as it is the best exposition of this vexed ground which has as yet appeared.

That such an amount of revision and addition of new material has been found necessary in so short a period as has elapsed since the first edition, is a tribute to the advance of the science of obstetrics and to the well-known progressive spirit of the author. W. R. N.

THE PREVENTION OF INFECTIOUS DISEASE. Being the Lane Lectures, delivered at Cooper Medical College, San Francisco, in August, 1906, and revised for publication. By JOHN C. MCVAIL, M.D., D.P.H. (Cambr.), F.R.S.E., County Medical Officer for Stirlingshire and Dunbartonshire, Ex-president of the Incorporated Society of Medical Officers of Health of Great Britain, and of the Incorporated Sanitary Association of Scotland. London. MacMillan & Co., 1907.

IN this country the question of public health organization and sanitation is receiving today well merited attention, and though, undoubtedly, great improvements have come about in the last few years through this interest aided by hard work, still there remain any number of important problems to be settled. As this is particularly true of the smaller towns and country districts, it is with great interest that one reads in this series of Lane Lectures the measures which have been adopted to prevent the spread of infectious and contagious diseases in Scotland and England. In this book Dr. McVail gives the reader a very good description of the way in which the Health Board of Great Britain has dealt with such diseases as typhus, typhoid, plague, measles, diphtheria, and scarlet fever. Though a portion of each chapter is devoted to a rather elementary discussion of the cause and prophylaxis of the disease under discussion, the greater portion of the lectures is concerned with accounts of the work of the Health Commissioners in combating the spread of the disease. It is interesting to note that in England and Scotland cases of typhoid fever are required to be taken to "fever hospitals," or isolated at home. Though the various methods by which the disease is spread are discussed in some detail, no mention is made of "bacillus carriers," a source of infection which seems to be of the greatest importance. It is stimulating to learn that active measures are being instituted against the spread of measles, a disease which McVail states has a mortality of 10 to 20 per cent. in children under three years of age. After the age of five the mortality is but 1 per cent., so that the policy which has been adopted is to try to delay the attack, which is practically inevitable, until after the sixth or seventh year. This has been accomplished, to a certain extent, through inspection of schools, through which institutions the disease is principally spread. In the chapter upon scarlet fever there is a good discussion upon the question of hospital ventilation, and though some of the methods of natural ventilation in vogue in Great Britain are not applicable to our American climate, still an estimate of their use is instructive. The book does not purport to be, and is not, a systematic treatise upon hygiene, but as a series of lectures, illustrating the methods adopted by a Board of Health for the prevention of certain specific diseases, it is interesting and instructive. W. T. L.

A MANUAL OF VENEREAL DISEASES, BY OFFICERS OF THE ROYAL ARMY MEDICAL CORPS. Introduction by SIR ALFRED KEOGH, K.C.B., Director-General of the Army Medical Service; History, Statistics, Invaliding, etc., by LIEUT. COLONEL C. N. MELVILLE, R.A.M.C., Secretary to the Advisory Board; Clinical Pathology and Bacteriology, by COLONEL LEISHMAN, R.A.M.C.; Clinical Course and Treatment, by MAJOR C. E. POLLOCK, R.A.M.C. Pp. 282. London: Henry Frowde, Oxford University Press; Hodder & Stoughton, 1907.

THIS manual is the outcome of the report made, in 1905, to the British Army Medical Advisory Board, by a committee appointed to consider the question of the treatment of venereal disease in the army. The subjects discussed are syphilis, gonorrhœa, and soft chancre.

Prevention of these diseases receives merited consideration; and when it is recollected that more than 9 per cent. of the army is incapacited on this score, the question of prophylaxis is seen to have great economic importance entirely apart from any question of morals. Colonel Melville, after briefly outlining the history of the methods of prevention attempted in military surgery, comes to the conclusion that besides mere discipline and punishment, the high ideal of abstinence from illicit intercourse must be constantly held before the soldier. He would be inclined "to allow a man to have two primary attacks of venereal disease without making more than a Company Entry. The third primary attack should be made a Regimental Entry." He says: "The making up of lost duties is a practical idea. The hardened sinner would know quite well that the longer he stayed out of hospital concealing his disease, the longer he would probably have to remain in hospital for recovery, and the more guards, etc., he would have to make up." In urging the ideal of continence, he asserts that "all other systems of prevention accept incontinence as a necessary part of male life, and aim at making it safe. They place the ideal, if it can in any way be called an ideal, as low as possible, and figures prove that they fail in any way, to attain their ideal, that is absolute safety."

The pathology, diagnosis, and treatment of the venereal diseases, and their commonest complications, are comprehensively detailed; the soft chancre being defined as "a contagious ulcer of the genitals, caused by the inoculation of the bacillus of Ducrey;" and the volume closes with tables and appendices showing the percentage incidence of venereal diseases in the army, and giving formulæ and outlines for the administration of mercurials in syphilis, and the solutions for injection and irrigation in gonorrhœa. A. P. C. A.

The Operations of General Practice. By Edred M. Corner, M.A., M.C., M.B. (Cantab.), B.Sc. (London), F.R.C.S. (England), Surgeon in Charge of Out-Patients at St. Thomas' Hospital, London; and H. Irving Pinches, M.A., M.B., B.C. (Cantab.), M.R.C.S., L.R.C.P. (London), Clinical Assistant to the Children's Hospital, Great Ormond Street, London. Pp. 296; 170 illustrations. London: Henry Frowde, Oxford University Press; Hodder & Stoughton, 1907.

The authors state that in this work they have attempted to meet a deficiency in professional education. This is, of course, a laudable ambition, but when it leads to the attempt to render general practitioners, with no training or previous experience in surgery, capable of undertaking such operations as those for the radical cure of hernia, for tuberculous cervical adenitis, for suprapubic cystotomy, plastic resection of mammary tumors, necrosis of the femur, complete rupture of the perineum, etc., etc., we think that the authors have rather overshot their mark. They expatiate at some length upon the fact that the old-time division of operations into major and minor has been largely obviated by aseptic technique; but they appear to forget that aseptic technique is acquired not from the perusal of text-books, but from prolonged apprenticeship in the operating room. Many of the "operations" described, such as the opening of a boil, gastric and vesical lavage, tapping a hydrocele, vaccination, etc., are properly enough done by the family physician; and while all the operations included are, indeed, those of general surgery, this term should not, we submit, be used as synonymous with operations which do not require surgical skill for their performance. The authors have avoided writing, on the one hand, a "Minor Surgery," and on the other, an "Operative Surgery." The result is an unhappy hybrid, which is "neither fish, flesh, fowl, nor good red herring."

With this warning, the volume may be commended as presenting adequate descriptions of the usual run of operations, sufficiently illustrated by diagrams and by cuts of apparatus. A. P. C. A.

A Laboratory Handbook of Bacteriology. By Rudolph Abel, of Berlin. Translated from the tenth German edition, by M. H. Gordon, M.A., M.D. (Oxon.), B.Sc. Pp. 224. London: Henry Frowde, Oxford University Press, 1907.

This little handbook should prove a valuable and acceptable addition to the libraries of laboratory workers not alone of the medical, but of allied professions. It is adapted not only to workers new to laboratory methods, by giving them proper ideas regarding general bacteriological technique, and by enabling them, quickly, to establish a workable laboratory routine, but also to the experienced bacteriologist, by presenting briefly the many little details of media preparation, staining methods, etc., so likely to be forgotten. Its chief merit lies in its compactness.

The first eighty pages take up the care of the microscope, the principles of sterilization and disinfection, the preparation of media, and a general discussion of cultural and staining methods. The next eighty pages are devoted to individual bacteria, considering chiefly the commoner and more important ones, in relation to special media to be used, cultural reactions, and best staining methods. Deserving of especial mention are the twenty-odd pages devoted to the typhoid bacillus. The last sixty pages give the methods for obtaining material from the body for bacteriological examination; of inoculation, postmortem examination, etc., of animals; of bacteriological examination of water, shellfish, etc., and of dust and air.

For the last third of the book, due credit must be accorded to Drs. T. J. Horder and A. C. Houston for their careful revisions and amplifications, and especially to Dr. Gordon—the translator—for his chapter on Immunity, which consists of a series of abstracts of articles by Wright, Douglas, Leishman, and others regarding technique and methods.

To the general practitioner, desirous of establishing a little working laboratory of his own, this handbook will assuredly be welcome. As stated in the author's preface, his manual is not intended to supersede or replace the larger text-books on the subject, but to serve as a supplement to them and as a guide to practical laboratory work, and as such it amply fulfils its author's purpose. V. L.

THE OPERATING ROOM AND THE PATIENT. By RUSSELL S. FOWLER, M.D., Professor of Surgery in the Brooklyn Post-graduate Medical School, New York. Second edition; pp. 284; 33 illustrations. Philadelphia and London: W. B. Saunders Co., 1907.

IMMEDIATELY upon its publication, Fowler's *Operating Room and the Patient* established for itself a useful place in the armamentarium of the surgeon, especially surgical internes of hospitals, and the nurse. The new edition contains all the good features of the old, and several additions. The chapters of general considerations in the after-treatment and on the instrument and supply room have been much amplified, and new chapters dealing with wound complications and their treatment have been added. The book unquestionably is of much service to all that have to do in any way with operative technique; to surgical internes and nurses it seems as though it were almost a *sine qua non.* A. K.

PROGRESS

OF

MEDICAL SCIENCE.

MEDICINE.

UNDER THE CHARGE OF

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The Diagnosis of Ulcer of the Stomach.—Bönniger (*Berl. klin. Woch.*, 1908, xiv, 396) asserts that the pain of gastric ulcer may be so characteristic as to justify the diagnosis of the condition. It is a matter of common experience, however, that the pains are often atypical or that they may closely resemble the pains of other diseases. To aid in the recognition of the pains arising from the presence of an ulcer in the stomach, Bönniger makes use of a dilute solution of hydrochloric acid which he pours into the empty stomach through the stomach tube. The proceedure is as follows: The stomach tube is introduced into the fasting stomach early in the morning. If one obtains no fluid, 100 c.c. of water is poured in, and after shaking movements on the part of the patient it is withdrawn and examined for acids, blood, albumin content, epithelial cells, and mucus. (This examination Bönniger finds very helpful in all stomach cases.) In ulcer no pain is caused by the introduction of the water, and it serves to eliminate psychic elements in the subsequent use of the acid solution. Next, one introduces through the tube 100 to 200 c.c. of $\frac{N}{10}$ HCl into the stomach. In patients with ulcer of the stomach severe pain ensues at once—usually relieved by giving milk. In no other gastric disease, including carcinoma, has Bönniger obtained a like result. If no pain is produced by giving the $\frac{1}{10}$ normal acid, change of position and shaking are resorted to, so that the acid may be brought into contact with all parts of the gastric mucosa. Failure to elicit pain now means that the pains of which the patient complains do not result from the presence of peptic ulcer, according to Bönniger's experience. Two essentials for the successful carrying out of the test are an empty stomach and the absence of supersecretion with high acidity. The test is of doubtful value in cases of ulcer when no pain exists; when the pain is atypical, it is a great aid. The test is further very useful in determining the efficacy of treatment; with improvement the pain produced becomes less, and entirely disappears when the ulcer is healed.

Gastric Secretion in Rectal Feeding.—Michael (*Berl. klin. Woch.*, 1907, xliv, 1446) concludes, from examinations made by him in Ewald's clinic, that neither in healthy individuals nor in invalids does the administration of a nutrient enema lead to the secretion of gastric juice, at least for one-half to one hour after giving the enema. Rectal feeding is therefore not in any way harmful in gastric ulcer.

The Basophilic Granules in the Red Blood Cells in Anemias.—Askanazy (*Ztschr. f. klin. Med.*, 1907, lxiv, 288) has changed his views about the origin of these granulations. He formerly believed, with the majority of recent writers upon this subject, that the basophilic granules are derived from the breaking up of the nucleus of the red blood cell. His opinion now is that they are the result of changes induced by the plasma upon polychromatophilic red cells. He has observed that the more intense the polychromatophilic staining of the red cell is, the more numerous, the smaller, and the more closely placed are the granules; conversely, the coarser and more distinct the granules, the more the color of the protoplasm approaches the orthochromatic. The same things he finds true of the erythroblasts. Askanazy does not look upon basophilic granules as the normal physiological expression of the disappearance of polychromatophilia, for cells showing these granules are not present in the blood of the embryo, the newborn, or in the bone marrow. The granules appear only when, in abnormal conditions, the chemical or physical characters of the plasma are changed from the normal. The basophilic granules are of diagnostic importance only in lead poisoning. Askanazy agrees, then, with Grawitz and others that the basophilic granules found at times in the red blood cells are not nuclear in origin, but, unlike Grawitz and his followers, he considers them a sign of regeneration of the blood, not a sign of degeneration.

The Ophthalmic and Cutaneous Tuberculin Reactions and Other Methods for the Diagnosis of Tuberculosis.—Wolff-Eissner (*Beit. z. Klin. der Tuber.*, 1908, ix, 1 to 189) has presented a very comprehensive study of the diagnosis of tuberculosis. The methods for the positive diagnosis of tuberculosis are given as (1) the demonstration of tubercle bacilli; (2) the agglutination test (Arloing); (3) the tuberculin test (Koch). The latest modifications in the use of tuberculin, namely, the cutaneous reaction (v. Pirques) and the conjunctival reaction (Wolff-Eissner, Calmette), are considered at length. After giving in detail the technique of administration, the author sets forth his results with these new diagnostic procedures. He finds that the conjunctival reaction is very much more marked in early cases (patients with few physical signs or none at all), while in the third stage of pulmonary tuberculosis the reaction may fail. Others have found failure of reaction in cases which advanced rapidly, and they have therefore criticised it, but this Wollff-Eissner considers one of its most valuable features; for in all such cases that he has observed the diagnosis was readily made by other means, and the absence of the reaction is, then a very valuable prognostic sign. Lack of reaction in manifest cases of tuberculosis means, he thinks, diminished powers of resistance on the part of the body, "an ominous sign." Cases are cited to substantiate this point.

Wolff-Eissner thinks it is too early to speak with confidence of the value of the cutaneous and conjunctival reactions in suspected cases of tuberculosis, as it is scarcely six months since the methods were introduced, and sufficient time has not elapsed to observe the further course of such cases. His experience, so far as it goes, is that the conjunctival reaction corresponds in results practically with subcutaneous injection of tuberculin. As to repetition of the conjunctival test, Wolff-Eissner believes that a positive result following one or more negative tests indicates a latent process.

Among 192 patients in whom no evidence of tuberculosis could be found on careful physical examination, 96 gave a positive cutaneous reaction, 35 a positive conjunctival reaction. The author believes, from clinical and pathological studies, that patients having healed "latent" tuberculous foci react to the cutaneous test, while it is only the active processes which are revealed by the conjunctival reaction —and these only when the resisting powers of the body are sufficiently high. In this way the enormous difference in the number of positive reactions in patients supposedly non-tuberculous is explained.

The use of the conjunctival and cutaneous tests is considered in pediatrics, dermatology, ophthalmology, gynecology, psychiatry, and veterinary medicine. Theoretical considerations follow. In the sputum of the tuberculous Wolff-Eissner calls attention to the importance of lymphocytes. In early cases he finds that they may constitute 33 to 90 per cent. of all cells in the sputum. The lymphocytes may be increased before tubercle bacilli appear in the sputum and even later with a mixed infection. The similar increase in the relative number of lymphocytes in the sputum in pertussis can scarcely lead to confusion.

(The article is so full and contains such a wealth of material that it is not suitable for a short abstract.)

Animal Inoculation in the Diagnosis of Tuberculosis.—Weber (*Münch. med. Woch.*, 1908, lv, 321) calls attention to the great value of animal inoculation and its comparative neglect in the diagnosis of tuberculosis. Guinea-pigs are used because of their great susceptibility to the tubercle bacillus. The procedure is as follows: Pleural exudate or urine is centrifugalized and the sediment is transferred to a small quantity of sterile physiological salt solution; with the sputum about 0.5 c.c. of it is placed in the normal salt. The salt solution containing the suspected material is then injected into the lower part of the abdominal wall. An acute inflammatory process may result from the presence of organisms other than the tubercle bacillus; if this accident is avoided, however, an enlargement of the regional lymph glands up to the size of a lentil may be palpated within ten to sixteen days—rarely later, provided the animal has been infected with tubercle bacilli. The lymph gland is removed aseptically under ether, embedded in paraffin, and sections are stained for Bacillus tuberculosis. If bacilli are few in number, it may be necessary to inoculate several animals before a safe conclusion may be reached. Traumatism (pinching) in the region of the lymph glands, as recommended recently by Bloch, may lead to an earlier swelling, but secondary infection with pyogenic cocci is common and greatly complicates the histological examination of the lymph gland. Weber emphasizes the futility of attempting to differentiate smegma and tubercle bacilli by staining methods alone, and strongly urges the more widespread use of animal inoculation in the diagnosis of tuberculosis. The time required is not great and the results obtained, with careful technique, are conclusive.

The Serum Treatment of Epidemic Cerebrospinal Meningitis.—SIMON FLEXNER and J. W. JOBLING (*Jour. Exp. Med.*, 1908, x, 141) note that in part of the work of the Commission appointed by the Department of Health of the City of New York an attempt was made to modify favorably the course of experimental injections with Diplococcus intracellularis (Weichselbaum) with sera prepared in several kinds of small animals. This was found to be successful in those experimented upon, and was tried on human subjects, but the cases were so few that the results were not included in the first report. Since then the diplococcus antiserum prepared by Flexner and Jobling from the horse has been successfully tested in cases widespread over this country and abroad, and this article is the report of the results obtained with the serum. These results are those in 47 cases reported upon, excluding 4 fatal cases which were not favorable for a reliable test. There were 79.9 per cent. of recoveries and 20.1 per cent. of deaths. Although the number of cases was small, yet the treatment was begun at such various times in the course of the disease that the tests were particularly severe. The results, therefore, have more value. When given within the first three days of the sickness the recoveries in 18 cases were 88.9 per cent. This is very encouraging when the usual high mortality is considered with other forms of treatment. In 25 instances the termination of the disease after injection could be followed; in 13 the termination was by lysis; in 12 by crisis. In a number of other cases the termination of the disease, after an acute and violent onset, within forty-eight hours of the injection of the antiserum was striking and impressive. Once or twice, after an abrupt onset of the symptoms lasting several days, relapses occurred, which were as promptly controlled by another injection of the serum as was the original injection. The introduction of the antiserum into the body by means of the spinal canal was justified (1) by the advantage of bringing the antiserum into direct contact with the focus of infection and inflammation, and (2) by the knowledge that elimination of colloids and crystalloids even from the blood stream into the cerebrospinal fluid is a slow and imperfect process in health, and probably more so in inflamed states of the membrane. In this report all of the cases received intraspinal injection. The effect noted by the direct application of the antiserum on the diplococci present in the exudate of the cerebrospinal membrane is most striking, and indicates rapid degeneration and arrest of the free multiplication of the cocci. Flexner and Jobling think that the dangers of anaphylaxis can be neglected at present. The early injection (within the first three days) gives the most promising results, and yet favorable effects have been recorded in many cases even as late as the eighth week. At present the dose of the serum rests upon an empirical basis, but the effects of the larger doses used lately can only be noted in many more reported cases. Flexner and Jobling are firm in their belief that more cases must be reported before any final conclusive proofs of the beneficial effects of the antiserum can be stated. Yet, certainly, from the beneficial effects so far noted, it deserves widespread tests; these should be carefully controlled, in order to prove or disprove the value of the antiserum. Since this article was prepared for publication a number of cases have been reported with successful results following the injections of the antiserum.

The Hemolytic Action of Ankylostoma Duodenale.—PRETI (*Münch. med. Woch.*, 1908, lv, 436) has collected the parasites from the stools of patients after administering to them extractum filicis maris or thymol. The worms were then washed in physiological salt solution several times and finally rubbed up in a mortar with a small quantity of the salt solution. The turbid suspension obtained in this way was neutral in reaction. Increasing quantities of the suspension were added to a 5 per cent. suspension of washed red blood corpuscles, placed in the incubator at 37° for two hours, and then in the ice chest until the following morning. Preti finds that Ankylostomum duodenale contains a hemolytic substance which is active not only upon the red blood cells of man, but also upon those of the dog, rabbit, ox, and guinea-pig. The hemolytic agent is insoluble in the normal salt solution, slightly soluble in alcohol and ether; it is thermostabile. Addition of lecithin increases its activity, and cholesterin does not neutralize it. After the suspension of the parasite has been digested by trypsin, the hemolysin is soluble in water. It was found that 2.5 mg. of moist ankylostomum sufficed to hemolyze 1 c.c. of the corpuscle suspension. The hemolysin discovered belongs to the lipoids and is analogous to those found in organ extracts, in bothriocephalus, and in sclerostoma. The relation of this hemolyzing body to the anemia produced by ankylostomum duodenale, the author will discuss in another paper.

The Parathyroid Glands in Osteomalacia.—ERDHEIM (*Zentralb. f. d. med. Wissensch.*, 1908, xlvi, 163) determined by animal experiments that a relationship exists between the parathyroid glands and calcium metabolism. Extirpation of these glands in rats led to fractures of the teeth and defective production of dentine. On the basis of these experiments, Erdheim examined the parathyroid glands of man in 6 cases of osteomalacia and compared them with the glands of 9 other patients dying of other diseases. The result was: Case I: An enormous hyperplasia of one of the parathyroid glands; in the remaining three glands, no change. Case II: One gland enlarged; all showed colonies of newly formed tissue. Case III: All four parathyroid glands, of which three were enlarged, showed signs of atrophy. Cases IV and V: No enlargements of the glands, but changes similar to those in Case II. Case VI: No changes. Tetany is often seen in patients suffering with osteomalacia. Tetany is definitely the result of injury to, or removal of, the parathyroid glands. Possibly a similar relationship exists in osteomalacia combined with tetany.

SURGERY.

UNDER THE CHARGE OF
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The Practical Application of Local Anesthesia to Fractures.—LERDA (*Zentralbl. f. Chir.*, 1907, xxxiv, 1417) says that general anesthesia is not always desirable for the reduction of fractures and the application of the necessary retentive dressing. The movements of the patient during the stage of excitement may be so violent as to require the aid of several assistants, and often the patient's stomach is full, so that the giving of a general anesthetic may prove dangerous. Local anesthesia has been employed with satisfactory results by several writers, and Lerda has used it during the last two years in 30 cases of fracture with unqualified success. The most important point in the technique is to locate exactly the line of fracture, in order that it may be well anesthetized. A syringe with a long, strong needle is best. The anesthetizing fluid should be injected first between the two fragments, then around the fracture region, so that the medulla, periosteum, and surrounding tissue will be well infiltrated. Lerda has almost always employed a cocaine solution (1 part of cocaine to 200 of physiological salt solution), to which is added some adrenalin (1 drop of a 1 to 1000 solution to 1 c.c. of the cocaine solution). A few minutes after the injection, light active and passive movements of the broken limb are painless. After six to ten minutes the anesthesia is complete, muscular contraction is absent, and the manipulations for the reduction can be carried out. The patient will complain only of an unpleasant feeling of tension due to the swelling of the tissues from œdema and hemorrhage. Lerda had the opportunity, in the same patient and for the same fracture, that of the lower end of the radius, to compare the relative merits of reduction without and with local anesthesia. The latter proved to be a decided advantage. Most of the cases in which the method was employed were fractures of the lower end of the radius. Good results were obtained in fractures of one or both bones of the forearm and of the humerus. Fractures of the elbow, except supracondyloid fractures of the humerus and fractures of the olecranon, are not suitable for this method, because they usually cannot be localized exactly enough to permit a rational anesthesia. For the same reason, fractures of the femur will probably be unsuitable, also because of their depth. Probably in a few cases of supracondyloid fracture of the femur it would be successful. It is especially applicable to fractures of the leg, the clavicle, and the ribs.

Coxa Valga and its Varieties.—Mauclaire and Olivier (*Archiv. gén. d. chir.*, 1908, ii, 1) define coxa valga as an affection of the hip, characterized by a valgus position of the whole lower extremity and an abnormal direction of the femoral neck (hyperflexion, hypoflexion, anteversion, retroversion). It has been found with the following deformities of the femoral neck: simple hypoflexion, hypoflexion with abnormal anteversion or with simple retroversion, hyperflexion, hyperflexion with abnormal anteversion or retroversion. The clinical varieties are: (1) Those occurring at birth, (*a*) by the essential deviation of birth, (*b*) in congenital luxation, on the luxated bone or on the opposite one by compensation, and (*c*) in hydrocephalus. (2) After birth it has been observed in osteomyelitis, achondroplasia, rachitis, exostoses, tuberculosis, fractures, epiphyseal separations, scoliosis, dislocations of the hip, ankylosis of the knee, club feet, paralysis, amputations, prolonged confinement to bed. Pathologically, there are four mechanisms: (*a*) Congenital coxa valga from a defect in development of the position of the femoral head; (*b*) coxa valga acquired by osteitis, traumatism, or by station (compensatory). The physical and functional symptoms vary according to the variety. The one chief symptom is abduction and external rotation of the lower extremity. The skiagraph permits an exact diagnosis of the different varieties. An abnormal direction of the neck of the femur is necessary. As for the treatment, if the coxa valga is essential and original, reduction with immobilization in one or more successive plaster dressings is necessary. Myomotomy and osteotomy may be indicated. If the coxa valga is symptomatic, it is evidently necessary to treat the causal condition.

Operations for Suppuration and Gangrene of the Lung.—Körte (*Arch. f. klin. Chir.*, 1908, lxxxv, 1) says that acute suppurative processes of the lung, without putrid decomposition and without sphacelus formation, should be treated for a few weeks by internal therapy. If, then, there is no abatement of the suppuration and the fever continues, pneumotomy should be done at once. In such cases this gives a good prognosis. Acute gangrene of the lung is to be treated as soon as possible by free exposure and excision. Only those bronchiectatic cavities confined to one lung should be operated on. The operation should be radical, with extensive resection of the thorax, free incisions, and, if healing does not result, the resection of a lobe of the lung.

McBurney's Point.—Lanz (*Zentralbl. f. Chir.*, 1908, xxxv, 185) concluded, after observing in a statue the furrow passing between the two anterior superior spines of the ilium, to make his incision for laparotomy in the lateral portion of the abdomen, as for appendicitis, in the line of this furrow, whenever a cosmetic effect was important. The deeper part of the incision was carried out on the McBurney principle of following the fibers of the different muscle layers. He found that by this incision he came more directly on the appendix than by the usual oblique incision. This led him to investigate carefully upon 20 patients the exact location of the appendix. He found that the attachment of the appendix to the cecum is more constant than is generally supposed, and that McBurney's point has nothing to do with the situation of the appendix. Much more frequently McBurney's point corresponds to the medial side of the ascending colon, and generally to a point 4 to 5 cm. above the base of the appendix. More rarely it lies over the angle formed by the ileum and ascending colon, and only in pathological cases, as in large abscesses, is it in the region of the base of the appendix. As a rule, the base of the appendix lies at the junction of the middle and right third of the interspinal line, *i. e.*, about a finger's length from the right anterior spine. If McBurney's point corresponded to the base of the appendix, it would not explain the significance of the tenderness at this point, since it is the point of the appendix which is most frequently diseased. Usually the corresponding sympathetic ganglion is made responsible for the pain. It has also been ascribed to a swollen lymph gland and to lymphangitis. Of 119 appendectomies, it was observed that in a few months after operation the tenderness at McBurney's point had disappeared in 93 cases, and that in 26 it still remained. The diagnostic value of tenderness at McBurney's point is therefore not always positive. Palpation may increase the inflammatory process in an inflamed appendix or set up inflammation in a normal one.

The Transfusion of Blood from the Vena Cava to the Portal Vein by Means of a Termino-lateral Anastomosis.—MEYER (*Zentralbl. f. Chir.*, 1908, xxxv, 217) calls attention to the work of Tansini, who performed the operation on dogs for the making of an Eck fistula between the portal vein and the cava. This operation has been done in man by Vidal. Meyer takes up the question of breaking the continuity and occasionally resecting a portion of the cava proximal to the entrance of the renal veins. Up to the present time this has been considered possible only when a previously existing stenosis of the cava had prepared it for ligation by improving the collateral circulation. Meyer offers a method by which the cava may be immediately ligated and divided and its blood allowed to escape at once into the portal vein. A dog was placed on a roll-shaped cushion for the laparotomy and an oblique incision made, beginning about 2 cm. below the xyphoid process and extending 10 cm. in the direction of the right anterior superior spine of the ileum. After opening the abdominal cavity the intestines and pancreas were drawn out of the wound, wrapped in a towel wrung out of a warm normal salt solution and placed on the left side. The portal vein was then freed as far as possible from its bed of transparent connective tissue with grooved director and forceps. About 1.5 cm. of its length was then included between rubber clamps, the jaws of which were covered with rubber tubing. The cava was then liberated from its bed in a similar manner and ligated on the proximal side, while on its distal side it was clamped with similar forceps. It was then divided transversely close to the ligature. The open end of the cava was then anastomosed by sutures to a longitudinal opening made in the corresponding side of the clamped off portion of the portal vein. The extreme tenderness of the latter made a very fine suture and gentle manipulations necessary, lest the coats tear and bleeding occur from the stitch holes. Nine days after the operation the dog was shown before the Berlin Medical Society. Sugar or albumin appear in the urine either immediately after the operation or later. The dog lived fifteen days, and thus proved that he could tolerate the transference of the caval blood through the liver, while other dogs with insignificant stenosis of the portal vein died in two days following the operation, with symptoms of hemostasis.

Concerning Diffuse Hyperostosis of the Cranial and Facial Bones. Osteitis Deformans Fibrosa (Virchow's Leontiasis Ossea).—Bockenheimer (*Archiv f. klin. Chir.*, 1908, lxxxv, 511) considers that the name, leontiasis ossea, is not suited to this disease. It is best designated by the term diffuse hyperostoses of the cranial and facial bones. The pathological process appears to be identical with osteitis deformans (Paget). The early diagnosis and differential diagnosis are best accomplished by the x-rays. The etiology is due to a faulty metabolism, so that it is in this respect probably related to other diffuse hyperostoses of the bones, as in gigantism and acromegaly.

The Treatment of Racemose Arterial Angioma.—Clairmont (*Archiv f. klin. Chir.*, 1908, lxxxv, 549) says that for the extirpation of such a growth the preliminary ligation of the afferent vessels, as is now carried out, is not absolutely necessary even when the growth is extensive. He reports a case of a man, aged forty-three years, with a racemose arterial angioma covering the greater part of the scalp. It was especially prominent on the left side in the temporal, parietal, and occipital regions, and in the same regions on the right side, but to a less extent. The left temporal artery in front of the ear was dilated to about the thickness of three fingers, and this dilatation extended below as far as the angle of the jaw. Over almost the whole of the involved area of the scalp the tumor was well developed, but only a few small dilated vessels affected the frontal region. The skiagraph taken in the frontal plane showed that the grooves for the middle meningeal artery were broadened and tortuous. Operation was performed with the patient in the sitting position and under morphine-chloroform anesthesia. An incision was made through the skin and subcutaneous tissue over the whole skull from left to right, beginning a finger's breadth above the outer canthus of the left eye. No preliminary ligatures were employed. The incision was first directed upward, and then was curved backward, crossing the middle line at the anterior part of the vertex of the skull, ending on the right side on a level with the external auditory canal at about the posterior border of the mastoid process. The incision was made step by step under compression of the large vessels against the scalp. The posterior branch of the temporal artery, about the thickness of the thumb, was isolated under the anterior lip of the incision and was divided between ligatures. The tumor was confined almost entirely to the scalp posterior to the incision. This portion of the scalp was separated from the skull like a flap and turned backward. This part of the operation was very bloody. The vessels entering the tumor from three sides were sought and controlled by numerous ligatures. This was particularly troublesome toward the right cheek and in the region of the right occipital artery on account of the rich anastomosis. The operation had lasted about one and one-half hours by this time, and it seemed that as much more time would be required to complete it. The pulse had become weak, and it was decided to postpone the extirpation of the tumor to a second operation as Krause had done. The skin flap was replaced, wrapped in sterile gauze, and an aseptic bandage applied. After the head was lowered and salt solution introduced intravenously the patient reacted quickly. Three days after the first operation the extirpation was completed under morphine-chloroform anesthesia. The flap was turned outward again and the loosened edges of the tumor easily found. The limits of the tumor were more definite because the vessels had thrombosed and the connective tissue between it and the skin had become thicker and looser from the œdema. The separation of the tumor, although difficult and time consuming, was successful throughout except for occasional perforations of the thin skin. The skin incision, now considerably larger than the wound defect, was trimmed accordingly and sutured to the anterior edge of the original incision. As was expected, a portion of the skin flap necrosed. This was about the area of the size of the palm, and was later covered by skin grafts by the Thiersch method. Here and there secretion collected under the flap and was evacuated, partly through the perforations made at the time of the operation and partly through new punctures. The remaining dilated portions of the right temporal and frontal arteries later diminished in size. On the day before he was to be discharged, however, he suddenly became unconscious without convulsions. After fifteen minutes he recovered sufficiently to speak intelligently and to permit a taking of the nerve findings. This proved to be normal except for a slight paresis of the right side of the mouth, due to a slight wound of the cheek, which had required two stitches. The history showed no evidence of previously occurring epileptic attacks.

Extracapsular Radical Resection of Tuberculous Elbow Joints.—Lossen (*Deut. Ztschr. f. Chir.*, 1908, xcii, 120) says that for the last thirteen years, in Bardenheurer's clinic, all tuberculous joints which have not shown a tendency to heal after a short conservative treatment have been operated on by Bardenheurer's method of extracapsular radical resection. The tuberculous area should be extirpated in sound tissue whenever possible without sparing joint ligaments, muscles, or their insertions, so that there shall be no remains of funguous tissue. If possible, none of the joint contents should be permitted to escape and soil the fresh wound surface. The indications for the operation have already been outlined by O. Wolf. In fresh cases an attempt should first be made to obtain a cure by the conservative method of immobilization in a plaster cast, giving at the same time iodoform injections. If improvement does not occur soon or the condition becomes aggravated, with increase of the swelling, pain, and abscess formation, resection should be done. If when first seen sinuses have developed, Bardenheurer proceeds at once to resection, whether the patient is a child or an adult. After removal of all diseased tissue, firm primary union of ends of the bones is sought, in order to prevent the development of a flail joint. For this purpose cuneiform osteoplasty is employed by making a V-shaped notch in the lower end of the humerus, fitting the end of the ulna into the notch, and fixing the two bones together by a nail, which is allowed to emerge from the skin. In order to retain the power of pronation and to remove thoroughly all the tuberculous process, which by preference settles in the space between the upper ends of the radius and ulna, the radius is sawed off 2 to 3 cm. lower than the ulna and is covered over with muscle tissue. The radius cannot then adhere either to the humerus or the ulna. The skin and muscles are then sutured and the joint is fixed with a plaster cast.

THERAPEUTICS.

UNDER THE CHARGE OF
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The Treatment of Angina Pectoris.—ALLBUTT (*Folia Therapeutica*, 1908, ii, 3) considers that in angina pectoris we have to regard three purposes: (1) To mitigate, if possible, the lesion of the aorta; (2) to reduce the stresses; (3) to block the inhibitory influence on the heart. To combat the local affection we may use antidotes, as in acute rheumatism, for instance, salicylates, or the iodides. In syphilis the latter, with or without mercury, would be required. In aortitis from such causes as influenza we have to trust to nature, but in intermediate instances, as gout, we have tolerably effectual, although empirical, methods. In relieving tension we have first the use of gentle and frequent mercurials and salines in such patients as tolerate them. Then comes the promotion of normal metabolism, first by means of exercise, which must be regulated with care. The same is true of diet; no full meal should be eaten under mental or physical fatigue and all meals should be restricted in quantity, but, on the other hand, in nstances of defective appetite, stomachics, strychnine, pepsin, hydrochloric acid, etc., may be indicated. Alcohol, strong tea, and coffee must be forbidden. The angina itself should first of all be treated by confinement to bed, but in old patients we must carefully guard against pulmonary congestion in ordering recumbency. With regard to arterial dilators, particularly glyceryl nitrate, we have a drug which must be watched, for, while Osler states that, if necessary, he is not afraid to prescribe the 1 per cent. solution in doses of 30 minims thrice daily, Allbutt has noticed a tendency to habit formation, and considers that "the physician should hold the prescription in his own hands." With regard to the iodides, unless syphilis is present, 3 to 5 grains thrice daily are sufficient. Venesection may be employed if hyperpiesis is primary and persistent. Baths, massage, and electricity, if employed at all, must be used under the strictest surveillance. In the palliation of attacks the nitrites are our chief reliance, but Allbutt urges the importance of blocking the reflex by which the heart is inhibited. This seems to be best accomplished by means of atropine, and he is accustomed to advise its administration until the liability to an attack seems to have vanished, and on the access of an attack he orders an immediate hypodermatic dose. Morphine is also a useful palliative. If Cheyne-Stokes respiration occurs, inhalations of oxygen and carbon dioxide alternately, or one of them in its appropriate interval, may be helpful.

A Pharmacological Study of Cannabis Americana.—Houghton and Hamilton (*Therapeutic Gazette,* 1908, xxxii, 26) conclude a study of Cannabis americana (Canabis sativa) as follows: (1) The method for determining the physiological activity of Cannabis sativa by internal administration to especially selected dogs has been found reliable when the standard dose, 0.01 gram per kilo of body weight of the unknown, which is reduced to a solid extract, is tested on the same animals in comparison with the same quantity of a standard U. S. P. extract by an experienced observer. (2) Cannabis sativa, when grown in various localities of the United States and Mexico, is found to be fully as active as the best imported Cannabis sativa, as shown by laboratory and clinical tests.

Trypsin in the Treatment of Malignant Tumors.—Graves (*Boston Med. and Surg. Jour.,* 1908, clviii, 121) states that it cannot be claimed that any great advance has been made in the actual cure of cancer by the use of trypsin. Nevertheless, the scientifically established fact that trypsin has a specific destructive action on the cancer cell and on the deadly ferment which it secretes, gives at least a gleam of hope that an effective method of applying it may be discovered.

Sodium Anilarsenate in Trypanosomasis.—Naegeli-Akerblom and Vernier (*Therapeutischer Monatshefte,* 1908, xxii, 77) review the experiences of various observers upon the treatment of sleeping sickness and trypanosomiasis in animals, and conclude that sodium anilarsenate (atoxyl) is less effective in these conditions than some have believed. The drug is dangerous in large doses, sometimes causing gastric irritation, colic, vertigo, and even blindness. R. Koch advises its early use in trypanosomiasis, the diagnosis having been made upon the appearance of glandular swellings and upon the examination of the blood; he does not, however, consider the drug a specific. Sufficient dosage would seem to be 7½ grains every two days for a period of two months; this amount may be given hypodermatically. With regard to the employment of trypan-red the authors are not enthusiastic, stating that it acts less upon the parasite than upon the host.

Calcium Chloride in Hemoglobinuric Fever.—Deaderick (*Therapeutic Gazette,* 1908, xxxii, 86) reports four instances of hemoglobinuric fever treated by calcium chloride, in which the results were not all that could have been desired. He concludes with the statement that the number of patients is too small to permit the drawing of definite inferences, but it would appear the benefits claimed by Vincent for the treatment were not obtained. Two of the patients died, and in both death was due to exhaustion resulting from the hemolysis, the very process which calcium chloride is used to combat. Deaderick considers the treatment worthy of further trial.

Salicylate Preparations in Bronchial Asthma.—Von Gresic (*Klinisch-therpeautische Wochenschrift,* 1908, xv, 96) is accustomed to employ aspirin in all cases of bronchial asthma since he obtained a rather remarkable result in a patient who had suffered from the affection for many years and who experienced striking relief from a marked asthmatic seizure following the administration of 15 grains of the drug; two hours after the first dose a second of equal size was given, after which the symptoms of the attack entirely subsided. Further attacks were treated in the same fashion and with considerable success. The aspirin seems to lessen the severity of the attack and to shorten its duration. In very severe attacks the addition of morphine is of advantage.

Treatment of Pleurisy with Effusion.—Barr (*Monthly Cyclopedia of Practical Medicine*, 1908, xi, 1) advises early removal of the fluid in its entirety, but before any negative pressure is established and before the patient feels any discomfort the siphon is stopped and an amount of air about equal in volume to the fluid withdrawn is introduced into the pleural cavity, then the remainder of the fluid is drawn off and a dram of 1 to 1000 adrenalin solution, diluted with about twice this amount of normal saline solution, is injected, and if it seems necessary more air is introduced to make the total amount equal to half or three-fourths of the bulk of the fluid withdrawn; the larger quantity of air is introduced in tuberculous patients. A siphon is preferable to an aspirator, because its force can be regulated and its negative pressure never exceeds 1 pound to the square inch. The adrenalin solution is introduced to contract the bloodvessels and to lessen the secretion, but its effect is not prolonged, and consequently it cannot be expected to lessen the secretion for any great length of time if there be a great negative pressure in the pleura. When the use of adrenalin is supplemented by the introduction of air, the negative pressure is lessened or abolished and the lung gradually expands as the air is absorbed.

Bismuth in Gastric Diseases.—Ruault (*Gazette médicale de Nantes*, 1908, xxvi, 114) perscribes bismuth subnitrate in 5-drachm doses in gastric pain (cramps, the pain of ulcer, cancer, and hyper- and hypo-acidity). The bismuth is given in a single dose in the morning and is suspended in about a pint of water. After taking it the patient lies for about ten minutes upon the back, each side, and upon the abdomen, and eats nothing for at least an hour. Constipation is not induced, the large doses tending rather to regulate the bowels. The treatment is of little avail in nervous dyspepsia, but is very effectual in gastrorrhagia and fermentative conditions. The bismuth has both a local and an antiseptic action; it soothes pain and protects ulcerations, lessens their tendency to irritation, favors cicatrization, and diminishes fermentation.

The Treatment of Pruritus Vulvæ.—Dalche (*La Quinzaine therapeutique*, 1908, viii, 505), in addition to treatment of the patient's general condition, institution of proper diet, the employment of calomel, if hepatic torpor is present, and hydrotherapeutic measures, especially the sitz bath in tepid running water, recommends various local applications, such as an ointment consisting of menthol, ¾ grain; guaiacol, 1 to 3 minims; zinc oxide, 2 drams; vaseline, 1 ounce. Ichthyol ointment is useful and very sedative in action. Powders are often effective also, especially orthoform, diodoform, and talcum. Local lesions, such as ulcerations, pustules, and the like, should receive appropriate treatment.

The Bromides in Epilepsy.—Spratling (*Albany Medical Annals*, 1908, xxix, 172) contends that the bromides have contributed nothing to the curability of epilepsy. If they are used at all they should not be given in doses to exceed 15 to 20 grains daily, and these amounts should be increased so slowly that bromism will not appear. It is unnecessary to cause bromic acne to get the physiological effects of the drug; 5 grains three times a day given on scientific principles is of far greater value than 20 grains at similar intervals given without heed to eliminative precautions.

The Influence of the Röntgen-rays upon Malignant Growths.—Beclere (*La Revue médico-sociale*, 1908, ii, 13) gives the following conditions as influencing successful Röntgen-ray treatment: (1) A more or less deep situation of the different cellular elements of the tumor treated. (2) A variable degree of the sensibility of these elements to the action of the rays. (3) The rapidity of evolution of the growth or the more or less rapid multiplication of its cellular elements. (4) The integrity or the involvement of the vascular system and more especially that of the superficial or deep lymphatics of the region.

The Röntgen-rays in Sarcoma.—Babcock and Pfahler (*Surgery, Gynecology, and Obstetrics*, 1908, vi, 160) state that the most potent single agent against sarcomatous growth is probably the *x*-rays. The rays have a destructive effect on all living tissue cells and an especially pronounced action against lymphoid and young connective tissue cells. Consequently the embryonic tissue of sarcoma is particularly vulnerable. The rays also increase the fibroconnective tissue in the area treated, and thus tend to produce a denser encapsulation of the growth and to obliterate adjacent lymphatic channels. There is no reason to believe that the rays increase the tendency to metastases. The technique should vary with the patient in hand. Usually in deep tumors the anode should be about 30 cm. from the skin; the exposure should average from twenty to fifty minutes, the application being divided between two different areas, the object being to have the rays enter from every possible direction. An old high vacuum tube is likely to give the best results, but with superficial lesions a lower and softer tube should be employed. In general, the rays measuring 6 to 8 (Benoist scale) will give best results. Usually 1 ma. of current is employed, as it is difficult to use a stronger current and keep the vacuum uniform. In protecting the skin the use of a diaphragm of sole leather interposed between the tube and skin is important. The treatment is given daily for months, or until the irritation of the skin or the disappearance of the neoplasm suggests increasing the intervals between the exposures. After apparent cure the treatment is kept up at intervals of from two to eight weeks for several years. At the outset the patient should be advised that the treatment will take a long time, and that the tendency to recurrence may only be overcome by occasional treatments for several years. The patients who show the greatest tolerance to the rays seem to do best.

PEDIATRICS.

UNDER THE CHARGE OF

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Cutaneous Reaction after Vaccination with Diphtheria Toxin.—B. SCHICK (*Münch. med. Woch.*, 1908, lv, 504) injected diphtheria toxin in various concentrations beneath the human skin to determine its reaction. After concentrating it to one-tenth its volume in vacuo at a temperature of 30°, he obtained a definite cutaneous reaction, which in appearance is identical with the reaction obtained after injecting tuberculin. Unless the operator knows which solution he injected, he cannot tell the difference between the two reactions. Clinically, the tuberculin reaction is not nearly so often associated with a central pustule as the diphtheria reaction; this pustule is not due to infection, since the toxin has been found perfectly sterile a number of times. The specificity of the reaction was proved by neutralizing the toxin with antitoxin in vitro and injecting this solution, without, however, producing a reaction. The same was true in all cases in which the toxin injections were preceded, by twenty-four hours, by injections of 1500 to 3000 units of antitoxin, thus immunizing the patient passively. If the antitoxin injection is made several hours later, the reaction is as often positive as negative. In cases in which the reaction followed upon the toxin-antitoxin injection it lasted but forty-eight hours, while after pure toxin injections it lasted 120 hours. This shows that the antitoxin influences not only the production of the reaction, but also the healing. Of 95 children ill with diseases other than diphtheria, 36 reacted positively, 59 negatively; of 55 ill with diphtheria, 52 reacted positively, 3 negatively. In the former instances the reaction was much less intense than in the latter. Shick explains the latter reaction by the individual predisposition of individuals toward diphtheria.

The Clinical Symptoms of the Cases of Epidemic Cerebrospinal Meningitis Admitted into Belvidere Hospital, Glasgow, during the Recent Epidemic.—Between May, 1906, and May, 1907, there were admitted to the wards of Belvidere Hospital, Glasgow, 128 bacteriologically verified cases of epidemic cerebrospinal meningitis; 55 were acute, 8 mild, 9 abortive, and 56 chronic. During the latter phase of the epidemic the cases were of a more acute type. There were 63 males, 65 females; 97 were below fifteen, 31 over fifteen years of age; of the former, 77 died, of the latter, 17; 17 of each sex recovered. W. Dow (*Lancet*, 1908, i, 768) has studied the cases collectively, and describes the symptoms thus: The symptoms of onset were usually sudden; headache, vomiting, and vertigo existed in most; sore throat preceded in many cases for several days. The physiognomy was very characteristic; cheeks flushed and even cyanosed, herpes at lips, suffused conjunctiva, rigid, stiff head and neck; Kernig's sign was nearly always present; stupor and less frequently delirium followed the onset. The skin symptoms included flushing at the commencement of the disease, pallor in advanced cases; goose-skin in chronic cases; tâche cérébrale throughout the course of the disease. The true rash was rarely present; when present, it consisted of small hemorrhages, which persisted from three to four days; it resembled the purpuric rash, but disappeared quicker; a general petechial rash was noted in 27 cases, only 1 of which recovered. Herpes, chiefly about the angles of the mouth, as in pneumonia, occurred in about 20 per cent. of the cases. Of the symptoms referable to the nervous system, pain was the most constant; the occiput, the frontal region, and the top of the head were the most constant seats of the pain. Next in frequency were the nucha and the spine. The state of mind may be one of apathy, and from this through every gradation to coma; delirium, however, was not infrequent; it varied between simple muttering and mania; it usually ceased as the pain disappeared, and thus does not mean convalescence, but rather the beginning of a chronic state. Hyperesthesia of the skin was common and intense; contraction of certain muscles was present in all cases, being most common in the posterior muscles of the neck and trunk. The plantar reflex was exaggerated in acute cases before the onset of coma; Babinski's sign was never obtained; the knee-jerks were exaggerated in acute cases before coma set in, but were absent in chronic cases. There was rapidly progressing emaciation in all chronic cases, but there were no trophic lesions. Chronic hydrocephalus was fairly common after the twentieth day; optic neuritis was associated with this. Convulsions, polyuria, and difficulties in deglutition were associated with its beginning. Convulsions were frequent in cases in children under one year of age. The pupils were contracted in delirium, dilated in coma; hippus was frequently observed; strabismus was moderately common in all stages; nystagmus was commonly observed in acute cases, occasionally in chronic; retraction of the upper eyelids occurred in hydrocephalus. The middle ear and the central auditory system were frequently affected, but Weichselbaum's organism was never isolated from the purulent discharge. Deafness was common in all cases in which recovery took place, and improvement does not result even after recovery. Taste and smell were not affected. Acute cases had a temperature range from 102° to 104°; it continued thus without remitting throughout the illness, and rose or fell before death. The pulse-rate varied greatly; it was usually accelerated, but sometimes much slowed; it was little influenced by variations in temperature. The respirations were accelerated from the beginning, usually out of all proportion to the pulse; modifications of Cheyne-Stokes breathing were noted. Vomiting occurred frequently; the appetite suffered only during the first days of the disease; the tongue was usually fairly clean; the spleen was not enlarged; the bowels were constipated; in acute cases, and especially in many of the children, there was loss of rectal control. Albuminuria was rare; glycosuria was never found; nephritis did not develop; incontinence of urine was common, particularly in children. Arthritic pain was rare; it affected chiefly the wrists, knees, and ankles; Weichselbaum's organism was obtained from the joints in only 2 cases.

Grave Chorea and its Relation to Septicemia.—B. Sachs (*Medical Record*, 1908, lxxiii, 505) reports two cases of a form of chorea, in which he considers the cause to have been a severe general infection. Chorea, like epilepsy, has become a generic term, and the cases of functional idiopathic chorea are becoming fewer every day; many have an organic basis, and quite a large number are purely infectious. Its possible infectious nature has been spoken of for the last thirty-five years, and in a number of instances microörganisms have been isolated from the blood and tissues of individuals whose death ensued in the course of chorea; in but few, however, have septic organisms been isolated from the blood of the living subject suffering from the chronic disorder. As organisms found postmortem may allow of different interpretations, it is very important, in every case of severe chorea, to make repeated blood examinations, so as to prove the presence or absence of bacteria in the blood of the patient during the earlier stages of the disease. The clinical symptoms of septicemic chorea may be summarized thus: Occurring chiefly among youthful individuals, a somewhat indefinite period of restlessness and slight twitching is followed by universal choreic movements; the jactitations are so severe that the patients have to be restrained; erosions appear all over the body; speech is difficult at an early stage, and later becomes impossible; this is due to the disturbance in the mechanism of speech and the mental condition, which may vary from mild stupor to active delirium; sleep is almost impossible, and requires large doses of hyponotics. Stupor and coma develop within a short time, and death usually supervenes shortly. High fever exists all through the condition, and a toxic erythema has been noted in the earlier stages. In Sach's first case blood examinations made during life demonstrated staphylococci; in his second case no organisms could be isolated. He suggests the following classification for chorea, omitting posthemiplegic chorea as having a definite organic basis: (1) Cases due to exhaustion of the nerve elements, no infectious cause being found; (2) cases associated with endocarditis, rheumatism, and fever; (3) chorea gravidarum; (4) senile and chronic chorea associated with arteriosclerosis, nephritis, and other degenerative changes; (5) septicemic chorea; for this group the bacterial origin has been proved without doubt. The prognosis is very grave and the treatment has thus far been unavailing.

Appendicitis during Childhood.—Appendicitis has been considered a graver and more fatal disease in children, not only by surgeons but also by pediatrists; this is due to the fact that appendicitis, like all other inflammations in children, undergoes suppuration much more quickly than in adults, and that the diagnosis is usually made much later, as children cannot localize the pain as readily; it is frequently considered a simple digestive disturbance. To help in the clearing up of the question of prognosis, W. Neuberg (*Deut. Zeit. f. Chir.*, 1907, lxxxix, 375) has tabulated 82 cases from Kredel's clinic in Hanover, with the following results: There were 41 males and the same number of females; 9 were between one and five years of age, 32 between six and ten, and the remainder between eleven and fifteen. Abscess formation was noted in 21 cases, 19 of which were operated on, with one death; in the other two cases the abscess perforated into the bladder with recovery. Of 11 patients who developed peritonitis (in 7 the condition was diagnosticated before the operation), 10 were operated upon, with 9 deaths. Of 38 patients treated expectantly, 1 died, a case of diffuse peritonitis, in which an operation was considered a hopeless undertaking. Of the 82 patients, 46 had been admitted to the hospital, and of these, 9 died, while of the 36 seen in private practice only 1 died. Light cases of appendicitis are frequently diagnosticated as intestinal derangement in children, thus removing many cases from the statistics which would make the prognosis of the condition seem more favorable. The youngest patient with a circumscribed abscess was twenty-one months old; operation was followed by recovery. In 15 cases fecal concretions were noted. In 2 instances intestinal obstruction developed four weeks after the acute attack; the patients were respectively six and eight years old; both recovered after operation.

OBSTETRICS.

UNDER THE CHARGE OF

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The Anatomy of the Pelvic Floor.—FOTHERGILL (*Jour. Obst. and Gyn. Brit. Empire,* January, 1908) contributes a well-illustrated paper upon the anatomy of the pelvic floor. He analyzes the views of anatomists who have written upon this portion of the body, and concludes essentially as follows: The so-called ligaments of the uterus lie loosely upon the subadjacent structures and have no supporting action. The broad ligament is a small part of the mesovarium or mesosalpinx. The ureterosacral and ureterovesical folds are not capable of resisting downward pressure, as is the round ligament, which is also of vestigial structure. The action of the external muscular layer of the pelvic floor is that of a sphincter rather than that of a support. The intermuscular layer of the pelvic floor is the degenerated representative of the tail muscles in the lower animals, and has largely lost its muscular action. The lower part of the levator ani acts as an adjuvant to the sphincters of the rectum and vagina. The classical descriptions of the fascia of the pelvis should be abandoned, and the fascia should be regarded as the sheaths of the muscles, the vessels, and the viscera. The internal muscular layer with its fascia forms the funnel-shaped pelvic diaphragm. This does not support the pelvic organs by its muscular action, and by virtue of its shape could not support the pelvic organs if they were not firmly attached to its sloping lateral walls. This attachment is accomplished by the fibrous sheaths of the blood-vessels and accompanying structures which supply the pelvic viscera. The most important cause of prolapse is relaxation of the perivascular sheaths. The attachments of the rectum to the back of the pelvis are distinct from the attachments of the urinogenital organs to its sides. The rectum does not descend with these organs when prolapse occurs. When the anterior rectal wall descends, forming a rectocele, it is united with the posterior vaginal wall by scar tissue, which is the result of infection during the healing of tears in the perineum.

Cerebral Hemorrhage during Pregnancy.—Jardine (*Jour. Obst. and Gyn. Brit. Empire,* January, 1908) reports the case of a woman eight months advanced in her third pregnancy. She had lost two children previously from premature labor at the seventh month. During the present pregnancy her health had been good, aside from excessive apprehension lest the child should die. She was suddenly taken with loss of power in the right hand, twitching of the face, and unconsciousness. On admission to the hospital the pupils were equally and closely contracted and reacted to light. The right arm was very rigid, flexed at the elbow, with the fingers clinched in the palm. The second aortic sound was accentuated, the urine contained albumin, the patient was very restless, and the fœtal heart could not be heard. The pelvis was contracted and the os admitted two fingers. The vertex of the child was presenting. The patient continued to be unconscious, and labor gradually developed painlessly until dilatation was complete. As there seemed to be no strain upon the heart and bloodvessels, and the fœtal heart could not be heard, no interference was practised. A further cerebral hemorrhage occurred, manifested by stertorous breathing and loss of sensation, the limbs becoming limp. The patient died about two hours after the second hemorrhage. An autopsy could not be obtained.

Osteomalacia Treated by Section at Term, with Removal of the Uterus and Ovaries.—Jardine (*Jour. Obst. and Gyn. Brit. Empire,* January, 1908) reports the case of a woman in her fifth pregnancy sent to the hospital in labor. She was suffering severely, her pulse being about 130 to the minute. The abdomen was greatly distended and pendulous and the skeleton considerably deformed. The pelvis was beak-shaped, the ribs softened, and the bones of the limbs very tender to the touch. The child was in breech presentation. The pelvis was so highly deformed that it was necessary to deliver the patient by section, which was followed by hysterectomy with intraperitoneal treatment of the stump. On section, the beaked condition of the pelvis could be seen very plainly. Mother and child made a good recovery. The osteomalacia present seemed to be completely arrested by the operation.

Toxemia during Pregnancy, with High Temperature.—Jardine (*Jour. Obst. and Gyn. Brit. Empire,* January, 1908) reports the case of a primigravida who, after influenza, had cough with vomiting, intense colic in the epigastric region, the influenza being followed by a pneumonia at the base of the left lung. When this subsided the patient became jaundiced, vomiting became worse, and the patient lost in weight. When admitted to the hospital her pulse was 130; temperature, 101° F. She was much emaciated, the tongue was dry and clotted, there was bleeding from the gums, the urine was deeply stained with bile, and considerable anemia was present. Shortly after admission to the hospital the patient had a chill, with tenderness over the gall-bladder. No tubercle bacilli could be found in the urine or sputum, and the Widal reaction was negative. A dead child was extracted by forceps, the liquor amnii and membranes being deeply bile stained. The placenta was normal. After delivery the patient's temperature fell, her general condition rapidly became normal, and she ultimately made a good recovery.

Stab Wound of the Fœtus in Utero.—Steele (*Surg., Gyn., and Obst.,* March, 1908) reports an interesting and rare case in which the fœtus in utero received an extensive stab wound. The mother, in a fit of anger stabbed herself with a knife in the right side of the abdomen, four inches to the right, and one and a half inches below the umbilicus. She was six and a half months pregnant. She was taken to the hospital and treated for one week, when the wound in the abdominal wall healed, and she returned home in good health. She was afterward delivered by a midwife of a living male child, fully developed, but having in the lateral aspect of the abdominal wall on the left side, one and a half inches above the anterior superior spine of the ileum, a mass of intestine the size of a closed fist. The child was immediately brought to the hospital for operation. On examination, a partially healed wound, one inch in length, was found. This wound had penetrated the abdominal cavity, and protruding through the wound, but not adherent to its margins, was the jejunum, the ileum, and all of the colon down to the sigmoid flexure. The upper part of the jejunum was enormously dilated, while the lower portion of the ileum and colon were coiled in an adherent and contracted mass. Meconium was found in the rectum. There were many firm adhesions around the margins of the wound, which entirely closed the peritoneal cavity. A transverse incision was made across the abdominal wall and the cavity entered with difficulty. On examination, the greater part of the intestinal tract was found outside of the abdomen agglutinated in the folds of the mesentery and omentum, and a plastic exudate. The entire mass was carefully restored to the abdominal cavity after the stomach had been catheterized through the œsophagus, and an effort had been made to introduce the tube through the rectum. To make the reduction, the child was held by the heels, with the head downward, and the edges of the wound were widely separated. The adhesions were so dense that one could not accurately recognize the condition of the intestine. The child survived the operation eight hours, and upon autopsy it was found that the jejunum had been completely cut across by the stab wound which penetrated the right abdominal wall of the mother, the right wall of the pregnant uterus, and the left abdominal wall of the fœtus. It is extraordinary that a stab wound through the abdominal wall of the mother, which wounded the child, should not have interfered with the growth of the child in the uterus, nor seriously affected the recovery of the mother. The two divided ends of the intestine were completely occluded by adhesions, and nearly three ounces of glairy sanguinolent fluid was found in the stomach of the infant.

Hematuria in Pregnancy.—Balloch (*Surg., Gyn., and Obst.,* March, 1908) reports the case of a multipara who had lived in a malarious region, and who at one time had expectoration of blood. Four years previous to coming under observation the patient passed blood in the urine. This occurred during pregnancy, and lasted ten days. During the next pregnancy there was no hematuria, but in the last pregnancy hematuria appeared and continued until the birth of the child. It varied in intensity and never entirely ceased. There was no history of renal colic. During the past year the patient has suffered from heaviness and stiffness in the left side under the ribs, with soreness upon manipulation. Swelling of the feet had been constantly present since the first pregnancy. On examination, the urine contained abundant red blood cells, but no casts. On cystoscopic examination the bladder and ureters were normal, and bloody urine was seen to come from the left ureter. The left kidney was removed, and found to have two patches of subcapsular hemorrhage. There were dense adhesions above the upper pole, which had to be divided before the kidney could be removed. The patient made a good recovery, and pregnancy supervened, and again blood appeared in the urine. After the birth of the child the hematuria ceased. On examining the kidney, glomerulonephritis was present, with increase in the interstitial connective tissue seen upon cross-section of the pyramids. A study of the cases, treated by operation, shows that hematuria has ceased with equal promptness after decapsulation, nephrotomy, or nephrectomy.

GYNECOLOGY.

UNDER THE CHARGE OF

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Ovarian Hematoma.—E. H. Wolf (*Arch. f. Gynäk.*, 1907, lxxxiv, 211) reports 8 cases of ovarian hematoma, 4 of which were associated with myomas. 1 was met with in a case of general and peritoneal tuberculosis, and 3 were complications of pelvic peritonitis. In no instance was the diagnosis made previous to operation. Dysmenorrhœa and menorrhagia were the only symptoms constantly associated with this condition. The symptoms, as a rule, were obscured by those of the principal conditions—myomas, peritoneal tuberculosis, and inflammatory diseases of the appendages.

The Pathological Changes Affecting the Endometrium.—A Contribution toward their Classification.—Elizabeth H. B. MacDonald (*Jour. Obst. and Gyn. Brit. Empire*, 1908, xiii, 3) strongly favors routine examination of endometrial scrapings, as it throws interesting light on the manifold changes, physiological and pathological, of the endometrium. She examined scrapings from between 200 and 300 cases, and has from that work concluded the following classification to be the best to be followed in such study: First, conditions arising from decidual and fœtal retention which includes (*a*) simple cases, such as simple inflammatory reaction and (*b*) the malignant type as chorio-epithelioma. Second, endometritis of infective origin. This class is subdivided into the acute and chronic classes. These conditions may be considered as being puerperal, gonorrhœal, syphilitic, tuberculous, or septic—from operative procedures, etc. Third, secondary changes, as (*a*) chronic œdema which embraces mucous polypus and (*b*) general hyperplasia; chronic venous congestion, and (*c*) increased vascularity. Her fourth and last class is that of new growths. These may be of a simple character of glandular overgrowth, such as (*a*) simple adenoma or papilloma; (*b*) papillary glandular hyperplasia; and (*c*) stroma overgrowth; or of a malignant type, as (*a*) malignant adenoma, (*b*) adenocarcinoma, (*c*) sarcoma. MacDonald's general conclusions are that the endometrium is to be regarded as an unstable tissue, subject to great physiological variation, readily affected by disorders of neighboring tissues, readily responsive to stimulation, but only rarely the seat of primary disease. Malignant disease of the body of the uterus is comparatively rare; simple tumor formation is uncommon; chronic infective endometritis is commoner than these, but still not common by comparison with the number of other conditions for which curetting is practised. In the great majority of the cases in which the uterus is scraped the endometrium has played a merely passive part in the pathological changes, although its removal may be a justifiable and even necessary part of the treatment.

Solid Ovarian Tumors.—Briggs (*Jour. Obst. and Gyn. of Brit. Emp.*, 1908), during the past twenty-one years, has operated for ovarian tumors in 488 cases, in 49 of which the tumors were solid. The 439 cystic tumors were divided as follows: 284 adenocystomas, 44 dermoids, 36 broad ligament cysts, 24 papillomas, 50 carcinomas, and 1 perithelioma (sarcoma). Of the 49 solid tumors, 31 were fibromas, 1 cellular spleen-like tumor, 3 fibromas of the ovarian ligament, 1 surface papilloma, 3 adenomas, 8 solid carcinomas, 1 solid teratoma (myxochondrosarcoma), and 1 round-cell sarcoma. Walker, studying this material, was impressed by the rarity of sarcoma, having found but one specimen among the 439 of cystic tumors removed. He found 50 carcinomas (1 in 9), and among the 49 solid tumors he found 8 carcinomas (1 in 6), making 58 of 488 ovarian tumors, or 1 in 8.4. Veit gives this proportion as 1 in 5.5 and Martin, in 236 cases, found it was 1 in 7.3. In the 488 cases of ovarian tumors sarcoma was found in but 3 cases (1 cystic and 2 solid). The proportion of sarcoma to carcinoma was 3 to 58, about 5 per cent. In the solid variety the proportion was 1 to 4, while in the cystic it was but 1 to 50. It may possibly be found that more sarcomatous involvement of the cystic growths will be discovered by a careful analysis of the 36 specimens classed as broad ligament cysts, inasmuch as sarcoma frequently invades ovarian cysts so situated. In considering the solid tumors, it is interesting to note that the fibromas were found in 31 of the 488 cases, that is, in 6.3 per cent. of all the cases. This is notably in excess of the usual estimate of 2 per cent. This however, may be due, at least in part, to Walker's inclination to regard as fibromas many that others might decide to be sarcomas. In this Walker seems to be supported by the subsequent clinical history of the patients. Apropos is quoted this paragraph: "Dr. Briggs was amongst the first to recognize that even the highly cellular connective tissue tumors of the ovary were not necessarily sarcomas; the after-histories of 8 cases of fibroma of the ovary and 1 case of fibroma of the ovarian ligament were then produced, the structures of the growths were described and illustrated. They, together with cases of Doran and others, formed the basis of a paper in support of the conclusion that solid, heavy primary tumors of the ovary were probably fibromas and not sarcomas." It is quite remarkable that 31 of the 49 solid tumors were fibromas and yet not one fibrocystoma was found among the 439 cystomas. Walker found the circumscribed ovarian fibroids were 9 in number, while 15 were diffuse and 7 pedunculated. In but 2 instances were the tumors bilateral. The pedunculated were usually larger than the circumscribed, as were the diffuse. Of the 8 cases of solid carcinoma, 7 were bilateral and secondary and 1 primary and unilateral. Ascites was present in 12 cases of fibroma and absent in the 3 cases of fibroma of the ovarian ligament. It was present with the surface papilloma and with 5 of the 8 solid carcinomas, with the solid teratoma and the round-cell sarcoma. When adhesions were universal it was always absent.

Parasitic Uterine Myomas.—T. S. CULLEN (*Jour. Amer. Med. Assoc.*, 1907, xlix, 1995) mentions several specimens of uterine fibroids that had become absolutely detached from the uterus and had acquired new sources of blood supply and given this name. The mesenteric vessels, the omentum, the bladder, the bowels, and the Fallopian tube have each thus acted as foster-mother for these growths. When the omentum is thus acting its bloodvessels are noted to be much enlarged, the fat is removed, and even the lymphatics take on hypertrophy.

Superficial Papilloma of the Ovary.—E. EMRYS-ROBERTS (*Jour. Obst. and Gyn. of Brit. Emp.*, 1908, xiii, 96) reports a case of this very rare disease. The woman, aged forty-seven years, had been married twenty-six years and had been pregnant once, which terminated in a full-term labor twenty-five years ago. For four months she had noticed swelling of the abdomen. The last two menstrual periods had been profuse. At operation a secondary growth was found in the peritoneum at the line of incision. The primary tumor was a large mass filling the pelvis. The opposite ovary presented numerous surface adhesions; it was enlarged to the size of a bantam's egg; on section it exhibited numerous follicles distended with altered blood. Several corpora lutea were present. A small psammomatous mass was attached to the right ovarian fimbria. The right ovary was completely hidden by a luxuriant papillomatous growth the size of a Jaffa orange; many of the papillæ were cystic and were distended with a clear fluid; a few psammoma bodies, the size of peas, were scattered throughout the growth. On section, the ovary was seen to be of normal size, and apparently in full functional activity. The whole of its external surface, with the exception of the hilum, gave origin to the papillomatous newgrowth. A microscopical section of the right ovary at a point where the tumor was typical, showed a normal condition of the ovary, except near the periphery where the stroma assumed a denser form, which is particularly associated with papilloma of the ovary, whether of the intracystic or superficial variety. The normal portion displayed the usual characters of a functionally active ovary. At one portion of the section the dense stroma near the periphery contained numerous acini lined by a single layer of epithelium, cylindrical in type, with deeply staining nuclei; this resembled in every particular the germinal epithelium, and thus demonstrated these acini to be ingrowths. The germinal epithelium also showed outgrowths or papillæ, each containing a core of dense fibrous stroma, which latter was seen to be undergoing serious degenerative changes in the larger ones. Emrys-Roberts concludes that primary superficial papilloma of the ovary is derived from the germinal epithelium and underlying connective-tissue stroma, that the vesicles so common result from papillæ whose cores have undergone œdematous degeneration, that secondary deposits arise from disrupted papillæ, and that the dissemination of secondary deposits is favored by ascites. And, further, that the ascites represents the secretion of the epithelium forming the outer covering of the growth.

OTOLOGY.

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The Diagnosis and Differential Diagnosis of the Vertigo of Meniere.—Frankl-Hochwart (*Archiv. f. Ohrenheilk.*, 1907, lxix, 233) makes two divisions of the cases presenting the complex of symptoms first described by Ménière, the apoplectic and the accessory; the former includes persons of previously normal hearing who become suddenly deaf, in one or both ears, and in whom the loss of hearing is accompanied by circulatory tinnitus, vertigo, nausea and vomiting; the later includes cases of vertigo, more or less pronounced, consequent upon changes incident to both acute and chronic processes, in the middle ear or labyrinth, and but rarely associated with diseases of the external ear or auditory nerve. In addition to these two main classifications it is necessary to consider the pseudo-Ménière attacks exhibiting the whole, or parts, of the symptom series, as observed in the neuroses or as aura of hysterical or epileptic attacks.

The prominent symptoms of the labyrinthine hemorrhage of Ménière are the excessive vertigo, loss of hearing, distressing tinnitus, ataxia, nystagmus and vomiting and, in some instances, in addition, brachycardia, later tachycardia, diarrhœa, sense of pressure in the head and dimness of vision. The diagnosis which is easily determinable by this array of symptoms is rarely evidenced between the attacks by any objective signs, the total loss of hearing being the main persistent indication of the causative accident.

In the accessory vertigo resulting from cerebral apoplexy, vertigo, and vomiting are frequently associated symptoms but in apoplexy of the labyrinth consciousness is rarely lost and there are lacking the paralyses, the aphasia, the hemianopsia and correlated symptoms which indicate a central lesion. In apoplexy of the labyrinth there is monaural or binaural loss of hearing, in cerebral apoplexy the hearing may be unaffected or there may be a temporary phonophobia.

The diagnosis of the cause of accessory vertigo is especially difficult when the examination is made between paroxysms; if there is no marked impairment of hearing a vestibular cause for the vertigo is unlikely, though it cannot be entirely excluded; when the hearing is greatly impaired a vestibular participation is probable, though very deaf patients may be subject to vertigo of purely extrinsic origin.

The vertigo accompanying oculomotor paralysis has little resemblance to that of apoplexy of the labyrinth, in the latter instance the patients sometimes complain of double vision but this is usually found on investigation to be rather a variability of vision with vague apparent movement of the objects seen; the vertigo accompanying refraction anomalies is wanting in the definiteness of direction of that excited by a lesion of the semicircular canals.

In all cases of vomiting, when the culpability of the digestive apparatus is questionable, an examination of the ear should be made, as likewise in cases of arteriosclerosis in which the vertigo assumes definiteness of direction; in these cases vomiting is rare though the circulatory tinnitus is sometimes excessive.

In cases of brain tumor the differential diagnosis is less difficult than might be supposed, the vertigo is usually severe and frequently accompanied by nystagmus and vomiting but tinnitus is rare and other symptoms, papillitis, paralyses, and psychic anomalies, which are not accompaniments of labyrinth lesion, usually present themselves; headache, according to the author, is an almost constant accompaniment of labyrinth apoplexy but never reaches the grade of severity characteristic of brain tumors.

In the differential diagnosis, in cases of suppurative middle-ear disease, between the vertigo of extrinsic, or middle ear, causation and that accompanying meningitis or cerebral abscess the vertigo in the latter instances is, according to the author, a less typical vertigo accompanied by tinnitus than a general vertigo, the true origin of which must be sought through the medium of ophthalmoscopic examination, lumbar puncture, and other investigating measures.

The vertigo of the neurasthenic is rarely typical in its manifestations and nystagmus is not an accompanying symptom. In hysteria and in epilepsy the diagnosis is often difficult on account of the masking symptoms and the fact that a simulatively typical series may occur with normal hearing, this relation of symptoms is rare in hysteria, the objective examination furnishing the clue to the real condition, while in epilepsy the diagnosis is determined by the convulsions, loss of consciousness, and other evidences of the true nature of the attack of which the pseudotypical symptoms are the aura.

Especially to be distinguished from the vertiginous paroxysms accompanying the presence of basal tumors is the cerebral polyneuritis with typical symptoms, first described by the author, in which there is acutely incident loss of hearing, vertigo, tinnitus, vomiting, accompanied by facial paralysis and herpetic eruption, but in which the prognosis is good for ultimate complete recovery.

Adenoid Vegetations and Impairment of Hearing.—Cohn (*Zeitschrift f. Ohrenheilkunde*, v. lii, p. 246). As an argument for the establishment of exact examination of the nose, throat, and ears in school children the author gives the result of his investigations in 1573 cases. Of this number 315, or about 18 per cent., were found to have a sufficient degree of impairment of hearing to make a professional examination advisable, although in the majority of them the impairment had not been noticed, either by the patients themselves or by the teachers. In 153 cases the impairment of hearing was directly referable to the presence of adenoids, and in 12 additional cases it was referable to the consecutive changes induced by adenoids which had spontaneously resolved. The number of cases in which adenoid vegetations could be regarded as the causative factor in the impairment of hearing in all the cases considered amounted therefore to about 52 per cent., and the author lays stress upon the importance of a preliminary examination of all school children, both objectively and by hearing tests, at their entrance upon school life, as well as at later stated intervals, and gives the Bezold estimate of 2 metres, for the whispered voice, as the lowest acceptable standard.

On Some Uses of Peroxide of Hydrogen in Diseases of the Ear, Nose, and Throat.—Lamb (*Folia Therapeutica*), October, 1907. In subacute and chronic suppuration of the middle ear peroxide of hydrogen is a useful application, acting, in the opinion of the author, not only as a disinfectant and deodorizer, but also, to some extent, as an astringent; furthermore its active effervescence, in contact with blood or pus, exercises a mechanical action which helps in the breaking up of masses of septic material and the detachment of epidermal scales, cleaning a septic ear better than any preparation with which the author is acquainted, and this without signs of irritation when used in the ten-volume strength of a pure preparation. When discharge from the ear is profuse the discharge should first be washed away by syringing with warm, boiled water, and the ear then filled with a cold solution of the peroxide. At the conclusion of effervescence the ear should again be syringed and dried, and appropriate applications made. In mastoid operations the author has found the peroxide of value in cleansing foul cavities and also in checking the profuse oozing from small vessels, the mopping of the wound being done with small strips of sterilized lint soaked in the peroxide. This solution has also been found to be serviceable in the loosening of the gauze packing in post-operative dressings, as, for instance, in the first dressing after a radical operation.

HYGIENE AND PUBLIC HEALTH.

UNDER THE CHARGE OF

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Tuberculosis of Alimentary Origin.—A. Calmette and C. Guerin (*Ann. de l'inst. Past.*, 1907, xx, 353) infected four cows with tuberculosis by introducing virulent bovine bacilli into the second and third stomachs by means of a stomach tube. All of the subjects acquired pulmonary tuberculosis without the development of any lesions in the alimentary tract. Calmette and Guerin believe that whereas tubercle bacilli are retained in the mesenteric glands of young animals often for long periods, with ultimate healing, and since this defence is less efficient in the case of adult animals, the so-called primary pulmonary tuberculosis of the adult is most often of intestinal origin. In a later paper (*ibid.*, No. 8, p. 609), in which the literature of the subject is extensively reviewed, Calmette and Guerin announce their conclusion, drawn from their studies and experiments, that the vast majority of cases of pulmonary tuberculosis are due to bacilli introduced primarily into the alimentary tract, and that single intestinal infections produce a mild form of the disease, during the course of which the animal reacts to tuberculin for a period of one or two months, and then frequently recovers.

According to Weber (*Deut. med. Woch.*, December 6, 1906) infection of the human subject with bovine bacilli is of vastly less importance than that due to those of human origin. It produces only intestinal and mesenteric lesions which point to the food as the vehicle of the exciting cause; these forms of the disease are much less likely to be transmitted from one victim to another. But inasmuch as bovine infection of the human subject is a real danger, all proper precautions should be taken to prevent its occurrence through foods and notably milk.

From a study of 4000 cases of pulmonary tuberculosis, including 700 which came to autopsy, N. Raw (*Lancet*, March 2, 1907) divides tuberculous infections into two groups: (1) Those due to bacilli of the human type. (2) Those due to bacilli of the bovine type. Under Group 1 are included phthisis pulmonalis, secondary ulceration of the intestines, and tubercular laryngitis; under Group 2 are included acute miliary tuberculosis, primary intestinal and mesenteric disease (tabes mesenterica, tuberculous peritonitis, tuberculosis of the pelvic organs), tuberculous lymphatic glands, tuberculous joints and bones, lupus, tuberculous meningitis, and tuberculous ulceration of the cornea.

In the Children's Hospital, Leipzig, H. Bruning (*Abst. Hyg. Rund.*, November 15, 1906, p. 1257) found evidences of tuberculous lesions in 44 of 400 cases which came to autopsy, that is to say, in 11 per cent. Of these subjects one-fourth were infants. Tuberculous bronchial glands were found in 34 (77 per cent.); the liver and mesenteric glands were found diseased in 25 (57 per cent.); the small intestine in 20 (45 per cent.); and the large intestine in 10 (23 per cent.). General miliary tuberculosis was found in 25 cases. In 8 cases there was evidence of tuberculous infection of the intestines and mesenteric glands alone, and these must be considered as primary infections. In not one of these cases had tuberculosis been diagnosticated during life and all of the victims had died of some acute infectious disease.

A. Eber (*Zeit. f. Fleisch. u. Milchhyg.*, xvi, 1906, Nr. 7, p. 218) inoculated a bovine animal with material from tuberculous human mesenteric glands, and then from this animal reinoculated another, which succumbed to acute miliary tuberculosis within a week. By passing the material through a guinea-pig first, and then inoculating a bovine animal, death resulted in fifty-one days.

L. Rabinowitsch (*Berl. klin. Woch.*, 1906, Nr. 24, p. 284) has summed up her observations on human and bovine tuberculosis and believes that the bovine variety does cause tuberculous lesions in man, but what proporton of cases are due therto cannot be determined.

H. Vallee's (*Comp.-rend. Acad. sci.*, cxlii, 1906, No. 20, p. 1101) studies incline him to the belief that in many cases of moxt extensive tuberculous involvement of the lungs and bronchial glands the initial lesion is in the intestine and due to tuberculous material in the food.

The same authority (*Comp.-rend. Soc. biol.*, 1906, lx, No. 19, p. 911) finds that normal-appearing mesenteric and other lymphatic glands of cattle may harbor virulent tubercle bacilli after infection from any source. We cannot conclude, therefore, that any of the lymphatic glands of a tuberculous animal are free from bacilli; hence, the importance of rejecting meat from diseased cattle.

Raw versus Sterilized Milk.—Bruning (*Zeit. f. Tiermed.*, 1907, x) has carried out some experiments which help to demonstrate how complex is the question of the comparative value of raw and sterilized milk in infant feeding. A litter of newborn animals was divided, and part were fed with raw and part with boiled milk of another species; the latter fared the better. On the other hand, animals fed on raw milk of their own species did better than those that received it cooked. Bohme (*Deut. med. Woch.*, October 25, 1906) made comparative tests with milk treated with hydrogen peroxide and perhydrase and sterilized milk. The former agrees well with infants more than three months old; but with those younger than that sterilized milk gave the better results. It is to be said, however, that the number of infants under observation was far too small to warrant much generalization.

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